Report on Reconciling Multiple Demands

DELIVERABLE 5.3

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1. INTRODUCTION – THE CASE STUDY CONTEXTS AND THE OBJECTIVE OF TASK 5.2

Understanding how to govern the nutrient emissions from the 634 sub basins[1] or 14 International River Basin Districts (RBD) that make up the Baltic Sea Region (BSR) has baffled policy and scientific communities for decades. Nutrient emissions in the BSR affect water quality, eco-system health, biodiversity which in turn undermines the very eco-system services that supports sustainable development across sectors, scales and different constellations of stakeholders. Additionally, several studies point at the considerable costs nutrient emissions incur on BSR tax payers in the quest to attain good environmental status as defined in the Baltic Sea Action plan (BSAP) (Alhvik et. al. 2014:172). According to Wulff et al. (2014), the minimum annual cost to meet BSAP basin targets is estimated to be 4.7 billion Euros. The latest HELCOM pollution load compilation report from 2014, suggests that since 1994, inputs to the Baltic Sea have been reduced by more than 200,000 tonnes of nitrogen and about 7,000 tonnes of phosphorus (HELCOM PLC 5.5, 2014). According the authors, this can be attributed to measures undertaken to curb emissions from point sources such as wastewater treatment and emissions to air and from diffuse sources within the forestry and agricultural sector. In regards to performance of the region in addressing sources of nutrients at a more general level HELCOM (2011:89) reports: "*Nutrient loading from diffuse sources is currently the major source of anthropogenic nutrients in the Baltic Sea catchment area and agriculture is the main diffuse pollution source. The proportion of diffuse sources has constantly increased during recent decades since the water protection measures have mainly been addressed, and in general have also been the most successful and cost efficient, on point sources*."

Despite the conviction inherent in the quantitative reporting found in numerous expert reports, the nutrient narrative in the BSR is characterised by high degrees of uncertainty. For example, HELCOM reports on data gaps for several riparian countries (PLC 5.5, 2014). These also happen to be the same countries that have experienced a significant growth in nutrient polluting industries; precipitated in part on account of the translocation of many polluting industries from more to less regulated contexts in BSR. Denmark for example, the country has reduced its emissions by 24% - more than any other Riparian, it has been suggested that the stringent environmental regulation is indirectly driving a shifting of the agro livestock industry to contexts where labour can be exploited more ruthlessly (Larsen and Powell 2010:800). Contexts with less stringent environmental regulations, have managed to achieve this in part by supporting the translocation of the polluting pig industry into less regulated contexts. Thus, we see a maladapted policy process where stakeholders are only held accountable for nutrient emissions at national level, even if their actions amplify nutrient emissions at a transnational level. This situation becomes even more wicked for non-EU countries such as Russia and Belarus, that do not share the same policy environment (the same two countries that are withholding data on their overall nutrient emissions). This robbing Peter to Pay Paul situation is indicative of the reductionist governance configurations that orchestrate the enactment of measures to address nutrient emissions in BSR region today. A situation that suggests that the state of the BSR is not as "known" as we are first led to believe.

[1] According to Hannerz (2006), there are 634 sub basins larger than 6 km^2.

Despite the substantial costs and the development of new, more systemic configurations (at least at a sector level) in governance such as the EU's Water Framework Directive (WFD) and the Marine Framework Directive (MFD), nutrient emissions continue to dominate science and governance agendas at different scales, local, national and regional. Situations in which nutrient enrichment is perceived as a dilemma tend to emerge at the nexus of several sectors. In this regard the Water, Food and Energy (WFE) is particularly pertinent, and it within this context that wickedness of nutrient enrichment is considered to be amplified with climate change and geo-political insecurity. Despite the overwhelming interconnections between the sectors that make up the WFE nexus, traditional sectoral and hierarchical governance structures persist in the enactment of the governance agenda. The point of the departure for the MIRACLE project is that the collaborative processes facilitated by social learning can transcend sectoral silos and societal domains, and even nation states. Social learning can serve to reframe pre-existing controversies and uncertainties and power differentials, by redirecting agency away from the one dimensional political voices in standardized transnational/national negotiations, to the multiplicity of voices and perspectives manifest in local contexts (Powell, et.al, 2016). It is within this context that the MIRACLE project intends to generate empirical insights using social learning as entry point to answer the larger research question: *how can sectoral and national boundaries, that define the pre-existing enactment of nutrient governance* (referred to as business as usual in this report) *be redefined to support a systemic nutrient governance regime?*

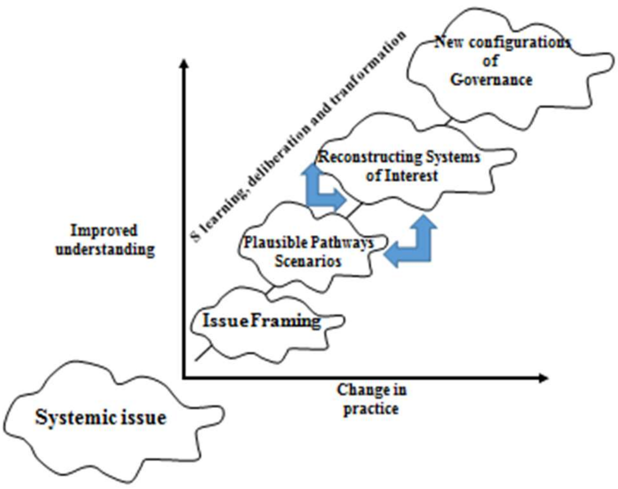

Figure 1. Process for a stakeholder driven implementation of MIRACLE in each case study area

1.1. Objective of this Deliverable

This project deliverable (D 5.3) reports on the research conducted within task 5.2 entitled "*Rethinking stakeholder boundaries and reconciling multiples demands.* The empirical insights for this task were gained through the facilitation of the social learning process that supported the emergence of plausible pathways and early phase reconstruction of systems of interest (see fig. 1). The process of pathway definition and reconstruction of systems of interest is still an ongoing process in the 4 case studies and thus this report should be viewed as research in progress rather than an exhaustive account of the findings from task 5.2.

To recap on the research process underpinning the social learning process thus far: Osbeck et al., (D 5.1, 2016) reports on outcomes from the research process facilitated during the issue framing phase. In this phase, stakeholders from MIRACLE´s 4 case study settings were invited to deliberate over the key problems connected to water status that defined their stakeholding in the respective catchments/basins. A soft systems methodology was used to both frame and document the social learning process (Checkland, 2000). The empirical insights from this phase supported identification of systemic issues in each of the respective cases. The notion of a systemic issue, and its conceptualization within the project setting, can be found in MIRACLE's deliverable 5.2. In brief, it is envisaged that deployment of the systemic issues will support emergence of a platform where (1) co-learning is possible which is grounded in practice or action, and (2) different interests can contest, deconstruct earlier, and reconstruct new common visions and plans (Powell and Toderi 2003). More practically, within the context of the MIRACLE project, the systemic issue is used to mediate critical reflection and co-deliberation between clients, actors and MIRACLE researchers in order to: *infuse a systemic cognizance into existing governance configurations and support the innovation of new governance configurations.*

In the original MIRACLE proposal, flooding was intended to serve a systemic issue to orchestrate the social learning process in all 4-case study settings. Flooding was motivated as a mediating object as it has a broad set of stakeholders that cuts across multiple sectors. Moreover, flooding, and indeed projections of its increase in frequency and intensity attributed to climate change, is making it increasingly difficult for different stakeholder constellations to meet their policy goals; and in particular, the goals that underpin nutrient governance. However, findings from the issue framing phase revealed that flooding was only relevant as a systemic issue in the one of the cases, the Reda Basin, and subsequently other more relevant systemic issues were sought to mediate the social learning in other 3 case contexts (in Berze it was *functional diversity*, in Helgeå it was *brownification* and in Selke, it was *biodiversity;* see Osbeck et al. 2016 for full account). This served as an important lesson about the shortcomings of prescriptive approaches when undertaking collaborative research with stakeholders.

The reporting that follows presents some of the preliminary findings resulting from the deployment of the systemic issue to surface the multiple demands and as support to the reconciliation of stakeholder interests and agency. In terms of stateholder positions, important insights have emerged early in the project pertaining important role position holders play in hindering or enabling change processes. The conceptual framing of both stakeholder and position holding can be found in the section that follows.

2. SOCIAL LEARNING: SURFACING AND RECONCILING MULTIPLE DEMANDS

In MIRACLE's original application, the project has framed nutrient enrichment within the BSR as a wicked problem situation because different constellations of stakeholders' hold diverging views in terms of its significance as a risk to good water status in their respective systems. Tackling nutrient enrichment as a wicked situation diverges from "normal" knowledge driven research processes. Wicked situations are characterised by irreducible uncertainty whereby the uncertainty of risks cannot be solved by more or better knowledge (Powell and Jiggins 2002:42). Along similar lines, an increasing body of studies suggest that nutrient governance failure can largely be attributed to how nutrients emissions are framed as a situation (Patterson, et.al. 2013;

Schöen and Rein 1994). In this regard, the targets underpinning the key policy vehicles[2] in the BSR context are generally presented as situations which are objectively knowable by both policy and science communities (ibid 2013). Patterson et al., argues that nutrient enrichment cannot be tackled alone via rational, sector bound and single level policy, planning and implementation (2013:442). In reference to Europe, Palmer, suggests that the existing risk governance apparatus has systematically failed to acknowledge the inherent difficulties of being cognisant of wicked situations. The consequence he argues, is that risk management strategies are both cognitively and democratically illegitimate (2011:495).

The sectoral status quo still defines the boundary conditions of our normal governance structures and scientific practice. In the MIRACLE project, our point of departure is that nutrient governance is framed as a tame problem rather than as a wicked problem in the BSR. MIRACLE has approached nutrient enrichment issue in the BSR as a multi-dimensional wicked problem. Under such conditions so called normal scientific traditions fall short in delivering a rigorous reconciliation of the issue. Normal science, underpinned by a positivist realist epistemology, demand a single and objectivist position regarding what constitutes good water status (Röling and Wagemakers, 1998). This in turn has been translated in to policy targets which are articulated as single values in parts per million (ppm) of phosphorous and nitrogen to define good water status. In recognition of wickedness of nutrient enrichment, MIRACLE's social learning work package has drawn on a post normal scientific tradition, underpinned by a constructionist epistemology. Post normal science attends to dilemmas that cannot be resolved via a normal science practice. Here we are referring to the uncertainty, diversity of legitimate plural perspectives and the presence of power differentials (Wals and Jickling 2002; Funtowicz and Ravetz 1993; Ravetz 2004, Powell et. al. 2016). As argued in the deliverable 5.2 the rigour underpinning this approach is legitimised via an intersubjective lens (Merleau Ponty, 1962; Husserl, 1989). In less abstract terms, it refers to the degree to which legitimate stakeholder perspectives and an extended peer community are included in the scientific process via social learning (Ravetz, 2004).

The social learning work package (WP5) has deployed an empirically informed, theory led process designed to purposefully engage stakeholders from 4 case study settings, in a social learning process with researchers from the consortium. For the purposes of the MIRACLE project *stakeholders* are those that have a "stake" – a real material interest, from their perspective, in a situation or a resource (SLIM, 2004). Stakeholding is the process by which stakeholders actively construct, promote and or defend his/her stake (ibid.) Multi-stakeholder events, such as the series of workshops facilitated in the 4 case study settings, have revealed that different stakeholders have diverging capabilities to promote, construct or redefine stakes. This capability, which henceforth is referred to as agency, is defined, promoted or defended by a *position-holding* (Powell, et. al 2016). The norms and structures in society inhibit or enable position holder's respective agency.

The underpinning theory, embodied in the following dimensions, collectively make up a conceptual framework deployed to support an understanding of multi-stakeholder/position-

[2] These include the Water framework directive, the Marine framework directive, and the agro-environmental component in the Rural development plans within the Common Agricultural policy in the BSR.

holder processes respond to the multi-layered wickedness, manifest within the MIRACLE case settings.

2.1. Uncertainty

In the first dimension (uncertainty), nutrient enrichment can be considered as an overdetermined problem. Overdetermined problems can be distinguished from *normal* or *tame* problems where cause and effect relationships can be quantified. Overdetermined problems are orchestrated by non-linear relationships, whereby, an actual cause may be causative but not explanatory. In such situations, the understanding requires a movement from the element level to the systemic level.

Table 1. Characteristics of the 'wicked problem' of nonpoint source water pollution
(Source: adapted from Patterson et al., 2013)

Uncertainty manifest as partial understanding	Multiple sources (e.g. urban stormwater, agricultural runoff and degradation, stream erosion) and generation of physical pollutant substances from many sites across a catchment (Gunningham and Sinclair, 2005; Hirsch et al., 2006; Macleod et al., 2007; Smith and Porter, 2010).
	Temporal variability and uncertainty in pollution generation and release (Hirsch et al., 2006; Macleod et al., 2007; Smith and Porter, 2010).
	Multiple direct and indirect drivers of NPS pollution relating to: human activities and land use practices; management approaches; wider social, economic, political processes, and environmental change (Smith and Porter, 2010).
	Cumulative impacts environmentally, socially, economically, but difficult to identify and link specific sources and impacts (Bellamy et al., 2001; Hirsch et al., 2006; Smith and Porter, 2010).
	Historical contingency (Collins et al., 2009) environmentally, socially, and institutional.

This type of uncertainty is different from stationary uncertainty, which is a tame problem and grows out of limitations of existing or chosen hydrological models or errors in algorithms underpinning the analysis (Hall and Solomatine 2008). Rather, this form of uncertainty has a non-stationary character, whereby the performance of a measure cannot be predicted probabilistically (Merz & Thieken 2005). Non-Stationary uncertainty is manifest in the inherent randomness and non-linearity of bio-physical and social systems. In this regard, climate change is considered to be a profound driver of non-stationary uncertainty within multiple domains (Dessai et al., 2009). Thus, performance of a certain measure must be carried out across a wide range of conditions and moreover it should also be able to accommodate unexpected changes (Klinke & Renn 2002, Lempert & Collins 2007). A number of the existing measures have been deployed to reduce nutrient emissions, but can be transformed into sources of emissions under extreme flow conditions. For example, wetlands that generally function as traps for phosphorus may release phosphorus during some high flow episodes resulting from e.g. extreme precipitation (Kynkäänniemi et al. 2013; Novak et al 2007).

The performance of different measures or actions in reducing the discharge of nutrient from watersheds is sometimes derived from so called normal loading rates, which in turn reflect mean discharge conditions (the normal conditions). However, a number of empirical studies point at the fact that nearly all nutrient export occurs at ≥ median discharge. Further, 50% of nitrogen discharge and 80% of all phosphorous discharge occurs at ≥ extreme discharge (90% percentile) (Royer et al., 2006). Therefore, the performance of particular measures needs to be estimated using tools that account for different flow regimes and the performance variability that this introduces. The uncertainty is likely to deepen as the climate changes and the frequency and intensity of extreme discharge episodes increase beyond what the models have been calibrated for. Thus, under conditions of deep or non-stationary uncertainty, the wickedness of these situations deem them as post-normal – situations that normal scientific praxis and normal policy structures are maladapted to reconcile. Moreover, in line with the underpinning epistemology of the social learning work package, we consider systems to be soft (socially constructed) and thus dynamic. Therefore, measures/actions need to be need to have a capacity to adapt and provide multiple benefits in order to accommodate, multiple, and or divergent and changing demands. As such, allowances need to be made for cycles of reflection on performance, learning and adaptation of actions/measures as new understanding emerges (Hutter 2006).

2.2. Controversy

The second dimension of wickedness, moral reasoning (controversy) can be applied to frame contested versions of the public good under, conditions, of *irreducible uncertainty* (Powell and Jiggins 2003). This dimension of wickedness draws on interactionist sense-making by drawing on a different epistemological basis (Collins and Ison 2009). Again, it deviates from the tame form of controversy that grows out of a neo-Malthusian rationale that increased scarcity of material resources will inevitably lead to resource exhaustion, insecurity and conflict (Gizelis and Wooden 2010). Inspired by this notion, Gareth Hardin (1968) presented his infamous essay “the tragedy of the commons” to speculate upon consequences of open access to common resources such as rivers, oceans and rangeland. Hardin argues that *conflicts of interest* over an open access resources, will inevitably lead to free riding and other selfish actions that ultimately degrades the system state. The ideas behind this essay has inspired decades of research into identifying appropriate environmental governance configurations to maintain a so called desirable system (system equilibrium) through the enforcement of rules or regulations by private, state and more recently common property institutions (Bromley, 1991 & Ostrom, 1990). The assumption that underpins Hardin’s argument is that a desirable system state is knowable for both of the dilemmas that are considered in his paper; e.g. open access to 1) the degrading grassland and 2) the polluted water body. Evidence from several significant EU research projects suggests that water resource contexts are characterised by social dilemmas, which grow out of the controversy over defining in what system state water is considered to be ‘polluted’ (Ison, et al. 2007, Powell and Osbeck, 2010). This recognition recasts the notion of ‘conflicts between interests’ inferred by Hardin into a ‘conflict of interest’, a situation that is underpinned by an ill-defined problem context which expert scientists are unable to transcend as the desirable state is not knowable (Powell and Larsen 2014). In these situations, the epistemology underpinned by a social learning process has a distinct advantage over the normal science epistemology.

Here the wicked situation attributed to controversy is manifest as an interest dilemma, and is seen to emerge out of the messiness and uncertainty attributed to contested views of what constitutes a desirable system state (Powell and Larsen 2012). Hence under these conditions, diverse constellations of stakeholders will apply different frames when articulating their perspective of good water status.

2.3. Power

Understanding stakeholding in context of nutrient governance requires more than being attentive to conflicts of interests between stakeholders; it also requires recognizing that there are competing claims over whom should have agency in the enactment of governance that determines the *system state.* A stakeholder who holds a position or capability to transform the resource or situation at stake, can be referred to as a positionholder. Equally well, a stakeholder's interest in a situation or resource can solely be driven by a quest for agency; independent of any material or biophysical stake. The endowed agency of positionholders can magnify the wickedness of these types of situations on account of a potential decoupling between the power to transform and the inherent stakes (Powell et. al. 2016). It is the positionholders who define the limits of the context or risk, e.g. nutrient enrichment, and thereby determine who is being rational in the process. Hence, viewing this from another angle, expert based risk assessment tends to exclude non-measurable concepts or moral dimensions, such as fairness, equity and rightness (Patterson, 2013:442). This in turn tends leads to a reproduction of a maladapted status quo (business as usual), which can be proactively orchestrated by positionholders as a means to retain high levels of agency.

The findings emerging from the MIRACLE project suggest that the means by which measures are prioritized, and implemented in case study settings are defined by nutrient centered perspective that is devoid of equity considerations and explicit acknowledgment of the real issues that mediate the underlying power brokering processes. In deliverable 5.2, for example, reference was made to a study undertaken by Westberg and Powell (2014). As part of their study, interviews were undertaken in six Swedish County administrative boards (CABS), those organizations responsible for developing and implementing River Basin Management Plans (RBMP). Their findings showed that within these organizational settings, collaborative approaches have a lower status than normal scientific approaches. Furthermore, the skills considered important for implementing collaborative approaches were coded as feminine by the inherent norms and structures. Hence collaborative approaches are not considered a core activity. This has led to the reproduction of prevailing inequities, whereby the dominant positionholders, male bio-physical scientists, have retained the agency in terms of enacting policy actions, such as the prioritization of measures within RBMPs.

We argue that the governance actions emerging from the one-dimensional discourse that underpins the nutrient enrichment issue in the Baltic Sea Region, tends to reproduce pre-existing norms and structures, and amplifies inequities, between sectors and different constellations of stakeholders. In order to bypass this vicious cycle of reproduction, MIRACLE has attempted to reconcile the multiple demands of stakeholders in the case studies by actively facilitating the reframing of water issues from a one dimensional good water status narrative (where the proxy is presently manifest as desired level of nutrients measured in parts per million (ppm) of phosphorus and nitrogen) to a water equity narrative. As a consequence, both interests (bio-physical and material stakes) and positions (space for human agency) are being co-deliberated on by project researchers, stakeholders and positionholders. In so doing, different constellations of stakeholders, who operate outside the pre-existing structures, will become visible, and may ultimately support the emergence of more systemic governance configurations.

2.4. A Conceptual model to support an examination of governance responses in situations characterized by multi-layered wickedness

The conceptual model emerging from empirical insights growing out of research conducted within tasks 5.1 and 5.2 supports an examination of multiple demands by governance responses in situations characterised by multi-layered wickedness. The model draws on earlier framings intended to elicit management/ governance insights in situations that are considered irreducibly uncertain. The original framing was presented by Holling (1973), and it continues to persist in a form, entitled the Renewal cycle. The renewal cycle grew out of advances embodied in the third law of thermodynamics (Prigogine, 1972). Prigogine showed that the exportation or dissipation of energy out of thermodynamic systems that were 'far from equilibrium' could reverse the increasing entropy rule devised by Carnot (1890) in the second law, which considers the entropy rule in closed systems. This inspired the general system theory that open systems and their inherent leakiness (dissipation) could be perceived as a desirable system property, a source of renewal and a precondition for self-organisation of ecosystems.

Cognisant of these insights from thermodynamics, the renewal cycle has been applied to assess management performance in ecosystems that are considered to operate as open systems far from equilibrium. This approach differed significantly from the equilibrium based rational embodied in a Clementsian worldview (underpinned by the second law), where there is a single final state (at equilibrium) for an ecological system – it´s so-called climax. Should a system deviate too far from climax, it is considered degraded and will require a significant period of 'succession' for it to return to this stable succession state (Clements, 1916). Although this world view is becoming outdated within the ecological community it still strongly shapes the assumptions that underpin natural resource management projects and processes. Economists to draw on their Malthusian and Adamsonian roots to devise management regimes reliant on system indicators such as exhaustibility, carrying capacity and maximum sustainable yield (Pearce and Turner 1996). Thus, the act of management and or governance underpinned by this rational is to maintain order and equilibrium in different contexts, such as forests, marine ecosystems, rivers and agricultural lands; manifest as structural measures. For example, drainage systems, wetlands and dykes, 'engineered' to protect cities, sewage treatment plants, valuable fish farming operations or farmlands – all of which are prone to nutrient leaching as a result of water inundations attributed to floods and storm surges (Miller et al. 2010; Mioduszewski, 2012).

In response to a critique of the Clementsian world view, the renewal cycle applied an empirically informed non-equilibrium rationale to demonstrate it impossible to have control via intervention in open systems. Owing to the importance of fluxes in stored capital to system integrity, this has been applied as an analytical axis in the Renewal cycle. A second analytical axis in the model was also applied to elicit insights into deploying technical structures and other engineered interventions to control the fluxes in stored capital. Control of the perturbations incurred by episodic events is considered to undermine the systems self-organisation in response to "deep" uncertainty associated with fire, floods, etc. The model also assumes that if the fluxes of stored capital are suppressed for too long, this may lead to an irreparable compromise of those eco-system functions that enable self-organisation.

Over the last few decades, the adaptive management approach has gradually gained momentum in a number of sectors of ecosystem management, and in particular in contexts characterised by deep uncertainty where significant fluxes of stored capital (resources) are the norm such as rangeland systems, fish populations in marine systems and forests affected by fire regimes

(Berkes and Folke, 1998). Significant fluxes in nutrient emissions in the BSR also seem to be the case, however there is surprisingly little discussion in this regard. In a recent publication by Arhemier et al (2012), an attempt was made to shed light on the hypothesis that climate change will affect the efficiency of suggested measures against eutrophication. The results clearly demonstrated the large uncertainty inherent in current climate predictions and hence in future nutrient loads and the outcomes from programmes of measures in the drainage basin.

More recently the scope of the renewal cycle has been extended to enable analytical insights into the performance of institutional/governance responses, for example political systems (ibid.). As part of the fifth framework water governance research project[3], the scope of the renewal cycle was further modified, to accommodate the epistemological position that system boundaries are contested. This paved the way for analyses to understand how social learning performs as a governance response in situations characterised by both uncertainty, and controversy. In order to accommodate controversy, the X axis, (degree of stored capital) was replaced by “degree of coherence of perspective”. This was motivated in line with a substantial body of scholarship that suggests that coherence between perceiving subjects is an essential property for the emergence of self-organisation. Moreover, in line with the line of reasoning presented earlier connected to irreducible uncertainty, namely situations that cannot be solved by more or better knowledge, manifest as norms, structures and values; the Y axis depicts the degree to which particular epistemological traditions orchestrate system state, ranging from from first order knowledge and facts through to second order processes of knowing. (see D5.2 p9 for a more detailed explanation of first and second order processes).

Insights from a recently concluded European and Global Challenges research project, CADWAGO, suggest that many actions designed to mitigate and adapt to climate change thus far have led to serious conflicts of interest and the reproduction of societal inequities (e.g. Larsen et al., 2014; Powell et al., 2017; Westerberg and Powell, 2015).[4] Drawing together these lessons offers an alternative reading of how to approach wicked and post-normal water governance situations. In contrast to the social learning discourse presented above, this equity based narrative articulates a way to attend not only to the material stakes by which stakeholders make their claims but also to those who actually have positions that grant them agency to define the mode by which governance is enacted. This understanding has paved the way for a conceptual model (figure 2) which is an adaptation of the eco-cycle first presented by Hurst (2010) to elicit an examination of leadership performance in dynamic organizations.

[3] SLIM fifth framework EU research project entitled Social Learning for Integrated Catchment Management

[4] Climate Adaptation and Water Governance project, www.cadwago.net

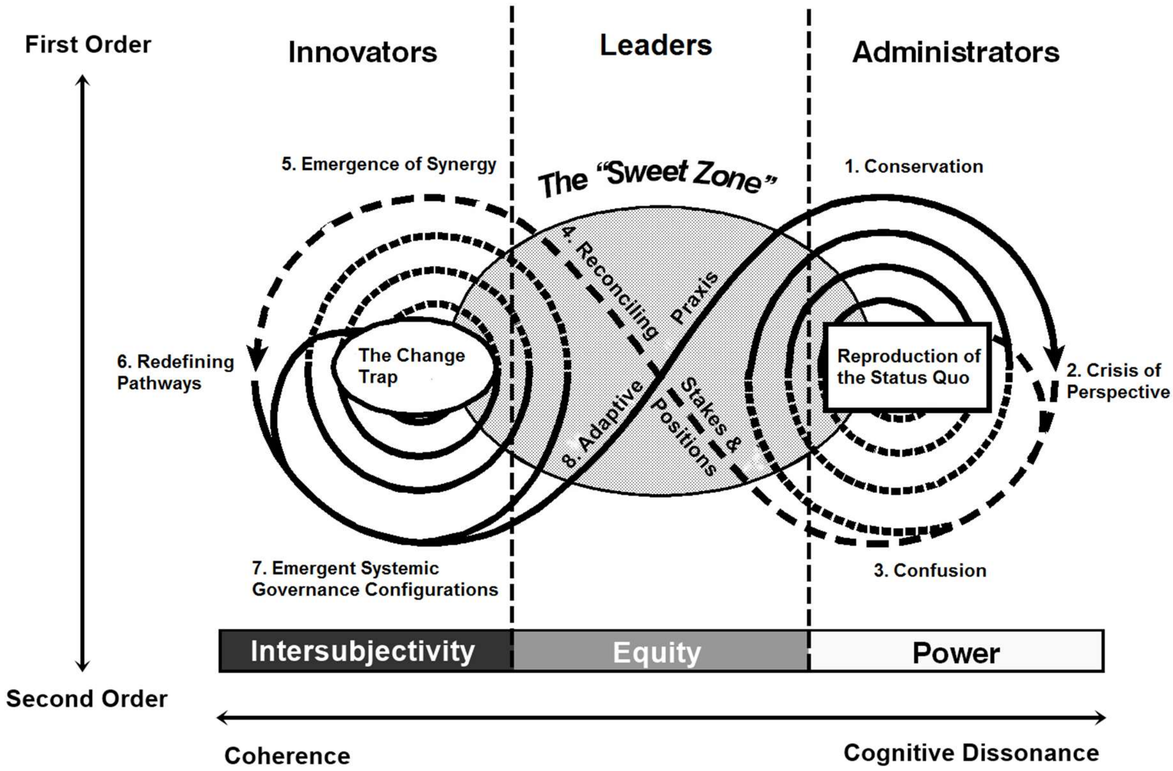

Figure 2. A conceptual model to support an examination of the reconciliation of multiple demands by governance responses in situations characterised by multi-layered wickedness. The capacity to reconcile the diverging stakes and positions, requires a capacity to cycle across two axes which should not transgress the sweet zone (the region shaded in grey). The sweet zone can be described as a space at the juncture of the stability ensured by structures and the capacity to change inherent in empowered agents operating on a level playing field- namely the presence of equity. Movement from left to right along the horizontal axis corresponds to increasing divergence of perspective. Movement from top to the bottom of the vertical axis corresponds to increasing use of 2nd order data in the process of knowing and learning. (adapted from Hurst, 2010)

By way of introduction to the conceptual model, state 1, the *conservation position,* reflects the legacy; a situation in which MIRACLE entered the BSR context by way of the case studies. The "conservation" phase is the "normal" situation (status quo or business as usual), where tightly bound structures, norms and values are deployed in the attempt to coerce collective action towards a desirable state defined by normal science. Governance is enacted within sectoral silos and the world view held by most empowered positionholders of water governance is linked to a system state, narrated as good water status. This system state is defined as a nutrient centred world view. Normal science[5] is extended to support the status quo through the provision of first order data generated by methods and tools developed to deliver facts and knowledge pertaining to nutrients flows in watersheds, catchments and basins. Underpinning the governance regime, are measures enacted within the Rural Development Plan (RDP) and River Basin Management Plans (RBMP) that prioritise nutrients emissions reduction; and not the multiple demands of stakeholders in these contexts.

[5] Normal Science has been elaborated by Kunh (1970), being described as the normal work of scientists, namely theorising, observing and experimenting within an agreed upon explanatory framework (Childers, 1995:84).

As a response to conservation legacy, the process design underpinning the social learning process has actively tried to facilitate a transition to state 2, a *crisis of perspective*; a state triggered by the provision of first order data that allows stakeholder and position-holders to critically reflect on their own and others respective systems of interests. This collective recognition of the presence of multiple diverging, but legitimate, perspectives of what constitutes a good water status, leads to an acknowledgement that there is more than a single desirable water state (good water status as per the RBMP, or single explanatory framework in reference to normal science). The presence of this controversy can provoke a crisis of perspective, a dilemma manifest in the collective awareness of actors of the cognitive dissonance underpinning the presence of diverging stakes.

The *confusion* phase, is triggered by an awareness that existing norms, structures and values that orchestrate collective basin actions are in fact maladapted to address divergent stakes (a post normal situation). It is within these situations that power vacuums appear and the transformation cycle comes to a crossroad. Either the pre-existing power holders reassume their agency by deploying first order rationale to optimise the current structures, which is essentially "more of the same", and thus resulting in a reproduction of the status quo. The alternative track is taken when new leaders step forward and deploy their agency to support reconciliation of stakes and positions in a second order mode supported by co-reflection. It is at this point the transformation cycle moves into the "sweet zone"; an environment that can be characterised by equity and trust; redefining the nature of the interactions.

In this reconciliation process the controversial situation is examined, and overlaps between systems of interest are revealed. This contributes to a more systemic understanding of the interconnections and inter-dependencies between stakeholders and positionholders. Previously they were entrapped within their respective sectoral perspectives which in turn reproduces the conflicts of interests. Emerging out of an environment defined by its equity, and systemic cognisance, processes of self-organisation shifts the transformation cycle to a state that fosters emergent *synergies* rather than conflicts.

The emerging synergies support a redefinition of the pathways as a vehicle for transformation towards common future visions that address the multiple demands of stakeholders. For the purpose of this research, a pathway is operationalised as: *an interconnected and synergistic set of measures and actions that are orchestrated by a strategic design to support systemic transformation*. At this point, navigational choices need to be made in terms of the pathways and this enables a phase of innovation. Again, as in the confusion state, the transformation cycle comes to a cross road. Here a risk exists for the process to slip into a *change trap*. The change trap occurs when actors are free to promote a particular pathway; however, in this case a rigorous criteria (intersubjective) for choice is absent. In the alternative track, when there are high levels of coherence between actors, a decision can be taken to enact a desirable pathway.

In order to enact the pathway, the transformation cycle needs to move into a state that supports co-enquiry into enabling governance configurations. These systemic governance configurations, re-define position holding and are manifest as new norms, structures and values. The social learning process ensures that the praxis underpinning governance retains its adaptive capacity in response to future uncertainties and controversies. Moreover, it supports deliberative navigation that keeps transformation principally within the bounds of the equity centred "sweet zone"

3. SUPPORTING TRANSFORMATION BY DEPLOYING SOCIAL LEARNING

Can social learning processes support a transformation of existing actions and measures and the development of new innovations so they provide multiple benefits? (Multiples benefits that enable a systemic and deliberative navigation that should ultimately be more adaptive). In order to answer the question above, this work in progress will report on the use of the systemic issues in reconciling diverging interests. Our principal empirical source is the pathways and the transcripts from the meetings. Here we are essentially bringing evidence of facilitation of the transformation cycle and that this has mediated a reconstruction of stakeholder's system of interests.

3.1. Methods

At the project level, Task 5.2 made up a set of methods that are intended to facilitate a social learning process in which stakeholders and positionholders make a cognitive journey from state 1 to 6 in the transformation cycle. In figure 3 an action learning cycle has been superimposed on the transformational cycle to depict the logic underpinning methods chosen as a means to support the process design. An introduction to action learning can be found in deliverable 5.2 together with the methods applied to mediate the process through the transformation cycle to phase 4, which is the point where the systemic issues emerged. The systemic issues were chosen because they could serve as a common context of meaning to support (1) the reconciliation of multiple demands on account of a synergistic overlap with multiple systems of interest (including nutrients) and; (2) a deliberative setting devoid of the power differentials that underpin the positions associated with the pre-existing water governance regime (status quo).

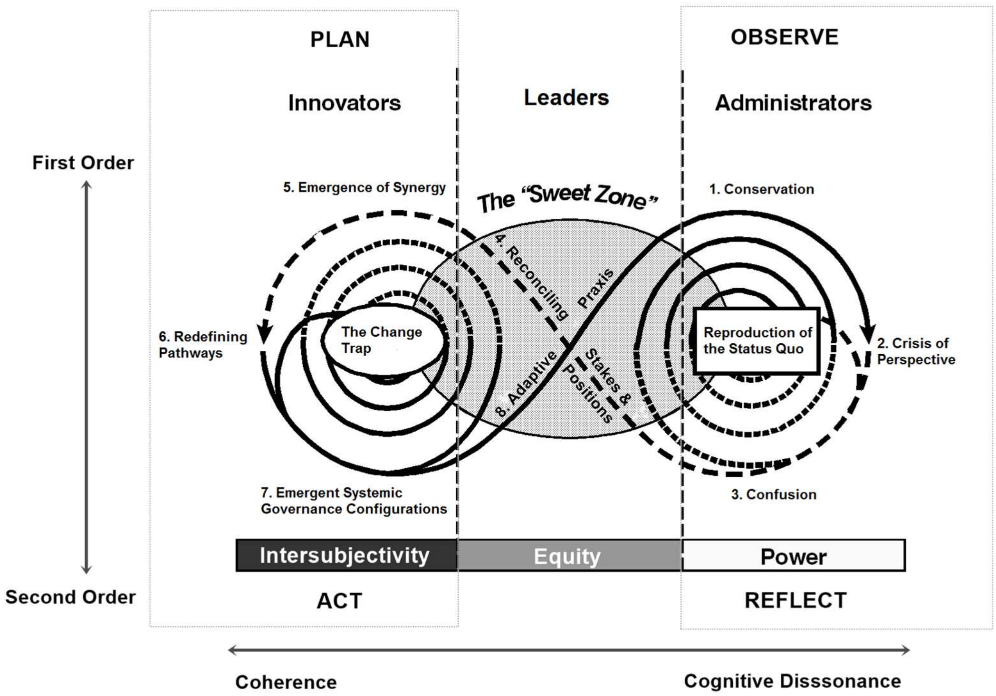

Figure 3. Transformation Cycle with Action Learning Cycle superimposed. Cycling respectively between Observe (first order right), Reflect (2nd order right), Plan (1st order left) and Act (2nd order Left). This learning cycle is iterative to ensure transformation is an ongoing process in order to navigate wickedness.

The stakeholder interactions in Phase 4 were organised as multiple focus groups in which stakeholders deliberated on how existing measures and actions could be adapted, and new ones employed to address the systemic issues, whilst remaining cognisant of their own stakes and emergent synergies were recorded by participant researchers. Growing out of this interactive process between stakeholders and MIRACLE researchers, pathways have been developed in consultation with stakeholders as a methodological innovation that could potentially serve as a vehicle to support a transformation that more systemically addresses the multiple demands manifest in case contexts (stakeholders purpose); whilst at a regional level also reducing overall nutrient emissions (researcher's purpose). Based on the results from the stakeholder consultations along with other types of input such as measures identified under different EU Directives, pathways were developed, i.e. configurations of different measures that describe the various routes to achieve the desired outcome with regards to the systemic issue. For MIRACLE, developing pathways could be seen as an analytical tool to identify new configurations of measures that could be further analysed and modelled.

Figures 4, 5, 7 and 8 below depict the constellation of measures that underpin the different pathways that has emerged out of phase 4. Here, the methodological support in the project has shifted to the planning phase (Figure 3), where the pathway's potential performance for transformation has been supported with first order data derived by the work of MIRACLE project staff. This has included modelling data that depicts the efficacy of the different measures (populating the pathways) in affecting water flows and reducing nutrient loads under different climatic and land use scenarios. Moreover, a multiple costs effectiveness data set pertaining to the different measures has been made available to support the learning process. Additionally, processes have been designed to stimulate critical reflection on the performance of pathways in terms of the basins' uncertain future. Here, different hydrological scenarios together with assumed significant drivers of future change for example, climate change, have been applied to facilitate this part of the co-enquiry process.

When developing the pathways, a cognisance of the systemic issue has served as point of departure. The "business- as-usual" (status quo) pathway has been included so it can be used to compare the various outcomes of the other pathways in reconciling multiple demands. This fostered reflection and learning across stakeholder groups, as well as increased understanding on the synergies and conflicts between measures. The pathways have supported a process of prioritization based on the constellation of measures and actions and measures so they address the systemic issue and thereby address multiple benefits. In so doing, they reveal both the synergies and conflicts between different measures, for stakeholders and positionholders.

The process pathway reconstruction is ongoing and will continue up until the cross-case workshop in late September 2017. This workshop marks the transition of the action learning process in "plan" to "act" domain. The cross-case workshop will support co-reflection on the enactment of the chosen pathways orchestrated via new governance configurations (new constellations and roles for positionholders).

3.2. Use of the systemic issues in reconciling diverging interests

The following table describes how the systemic issue has been used as a mediator for reconciling diverging interests, highlighting the strengths and limitations in all four cases.

Table 2. The strengths and limitations of applying the systemic issue in the four case areas of the MIRACLE project.

Case study	Systemic issue	Strengths	Limitations
Berze	Functional diversification	• The systemic issue was a means *to consolidate water resource management issues* identified and prioritized by the stakeholders.	• The systemic issue was not used as the entry point into reconciling multiple interests. Rather, reconciliation was focused on the design and location of the proposed measures to improve the water ecosystem in the Berze river basin.
Helge	Brownification	• The systemic issue was used *to assemble a diverse set of stakeholders*. Despite scientific disagreements on the cause of brownification, its impact on all stakeholder groups was recognized as one of the key challenges in the Helge river basin. • It was the *organization principal* in various stakeholder interactions, offering the stakeholders *an opportunity to meet across sectors of interests and discuss* the issue of brownification.	
Reda	Flooding	• The systemic issue has been *an excellent platform to present, discuss and agree on diverging interests* as flooding is somehow having an impact on all of the stakeholder interests. • It is a good subject or reason to engage with the stakeholders while also allowing for other important topics to emerge. • It can be further used as *a platform to educate or increase awareness among stakeholders* not only on flooding but also on other issues, which have not been given the “systemic” status.	• Despite the validity of the systemic issue, it can be *misused and abused*. • When using the systemic issue only as a social learning process tool, it may become quite frustrating, that *discussions are not transferred into actions*. Therefore, the practical perspective of working with systemic issue needs to be taken into consideration.
Selke	Biodiversity	• Biodiversity emerged as *a common topic of interest* of agricultural and water-related stakeholders early on. Additionally, the different issues driving the interests of the stakeholders reflect a range of different ecosystem services and are closely linked[6]. • The joint interest and perceived relevance of biodiversity in the early discussions led to the *expansion of the stakeholder group* with key biodiversity stakeholders added. The discussion of biodiversity issues helped to *break up existing and rigid conflicts* between agricultural and water-related interests. • Biodiversity also functioned as the *linking element or objectives* of land use measures and measures identified by the stakeholders.	• Biodiversity was mainly discussed as an issue related to the ecological quality of streams. The discussion *rarely expanded into broader biodiversity issues* that are not linked to water quality aspects. • If discussions were to expand further, e.g. with different land owners and managers, a potential weakness and threat in the use of biodiversity would be that it is just *seen as another environmental topic (a substitute for water quality)* targeted at imposing further regulations on land use.

[6] For example, agricultural activities primarily aimed at utilizing economic or market-based functions (provisioning services) of the ecosystem impact on water quality aspects such as the ecological status of water bodies and the nutrient enrichment in ground and surface water as well as affecting at the same time farmland biodiversity (including biodiversity on water margins and riparian strips). Ecological status is assessed by biological indicators, supporting physicochemical, and hydromorphological parameters. Changes in the ecological status of water bodies directly affect the aquatic biodiversity as well as biodiversity along the water bodies. Vice versa, (policy) measures aimed at biodiversity conservation also affect water quality and provisioning services such as food production from agriculture.

3.3. Stakeholder-driven development of pathways for improved water management

In the individual case study sites, participating researchers have developed a number of pathways that represents a distinct alternative in terms of perspectives on water management in the river basin in question. The different pathways have been composed based on stakeholder input received during a series of consultations in the form of focus group discussions and workshops.

The actual structure and configuration of the pathways varies quite significantly between the case sites. In some instances, there are pathways that include only a couple of measures each, whereas in other cases, the pathways can comprise up to seven different measures. These differences reflect the diverse set of context-specific issues and conditions in the river basins, and a key rationale for the stakeholder-driven process in MIRACLE is to allow for a bottom-up contextual development of water management strategies.

3.3.1. Berze

The stakeholders were engaged in an iterative process in a sequence of different activities aiming at ***collaboration and co-learning***. The key stakeholders were ***consulted*** on the relevant issues in the Berze River basin. *Interviews* were held at the beginning of the process in order to set up system boundaries. Various pressures – point and diffuse source nutrient pollution and hydro-morphological alterations – impact on the structure and functions of the Berze River ecosystem and provided ecosystem services.

All stakeholders including representatives from local municipalities and interest groups were invited to the *first common workshop* to work together with researchers to determine priorities for water resource management measures aiming at improving the water ecosystem in the Berze River basin. The ***collaboration*** process was moderated by an outsider – facilitator. The competent water authority (LEGMC) and researchers provided information to characterise the status and pollution loads in the basin. The stakeholders identified and prioritized the most relevant measures to be addressed by the project. The results were taken-up by researchers to elaborate further on the systemic issue and to structure potential pathways.

Individual groups of stakeholders (agriculture, municipal wastewater treatment) were ***consulted*** to refine pathways and to work on specifications for measures; researchers organized two small workshops and sent out questionnaires to acquire data and information needed for modelling work, cost-efficiency assessments and assessment on water governance issues.

All involved stakeholders including researchers, policy makers and planners were invited to the *second common workshop* for enhancing the preliminary project results. This event was organised in ***co-learning*** mode. The stakeholders actively discussed and shared their knowledge and opinions about the design of the pathways and measures and respective modelling results. The workshop helped to finalize the descriptions of pathways and measures, to discuss multiple benefits of the proposed measures.

All involved stakeholders will be invited to the *third common workshop* to learn about and discuss project outputs – environmental effects of proposed measures, cost-effectiveness assessment of proposed measures and to discuss future approaches to improve governance in the Berze catchment and in the Latvia as the whole.

The following figure depicts the constellation of measures underpinning the different pathways that have emerged in the Berze case study thus far:

Pathway 1: Business as usual

- Greening measures (ecological focus areas, crop diversification, permanent grasslands)
- Agri-environmental measures (biodiversity preservation in grasslands, ecological horticulture, maintenance of stubble cover during winter period)
- Organic farming

Pathway 2: Wastewater Treatment Plants

- Upgrade wastewater treatment plants

Pathway 3: Agri-environmental

- Ecological buffer strips
- Sedimentation ponds
- Reduced fertilizer application

Pathway 4: Hydro-electric Plants

- Fish-ways installed on 5 Small Hydro-Electric Plants

Figure 4. Development pathways in the Berze river basin

3.3.2. Helge

In the Helge case study, the stakeholder consultation process led to the development of three different pathways as follows:

- Business as usual, based on formal and official water management plans, primarily those developed by the Swedish Water Authorities (Vattenmyndigheterna)
- Ecosystem-based approach, where focus is on restoration of ecosystem services that have been lost over time through the establishment of an extensive system of ditches that have led to drastic landscape alterations.
- Improved water management in forestry, where focus is on the potential of adaptive forestry practices to better address water quality issues.

The following figure depicts the constellation of measures underpinning the different pathways that have emerged in the Helge case study thus far:

Pathway 1: Business as usual

- Liming (by air, by doser, by boat)
- Buffer strips
- Non-productive field margins in agricultural landscape
- Upgrading of private sewage treatment systems
- Established Wetlands
- Upgrade or removal of traditional water regulating dams

Pathway 2: Ecosystem service approach

- Storm water ponds
- Flood plain targeting agriculture production areas
- Riparian zones in agricultural landscape
- Wetlands
- Re-meandering

Pathway 3: Improving water management in the forestry sector

- Restoring wet forest
- Riparian zones in forest landscape
- Transition from coniferous to broadleaved forest
- Facilitation of Fish Migration, size 1
- Facilitation of Fish Migration, size 2
- Facilitation of Fish Migration, size 3
- Facilitation of Fish Migration - Culvert Replacement

Figure 5. Development pathways in the Helge river basin

In Helge, the 3rd stakeholder workshop provided critical reflections on how the alternative pathways have been developed and the narrative underpinning the title. The discussions generated suggestions for additional measures and removal of some existing measures. The alternative pathways have been designed by researchers in MIRACLE based on the input from stakeholders in the consultation process of the project.

During a workshop carried out in March 2017, these pathways were presented to a group of stakeholders representing a wide range of interests in the river basin, including (but not limited to) public officials, NGOs and representatives from the agriculture, forestry and hydropower sectors. Whereas previous stakeholder consultations had focused on one group of stakeholders at a time, this workshop provided the opportunity to allow for discussions among stakeholders across the whole spectrum of interests in the river basin.

The stakeholders were divided into three groups that each represented as broad a sample of the different stakeholder interests as possible. The first portion of the workshop focused on dissecting the business as usual (BaU) pathway in two steps. The first step consisted of a group discussion on the pros and cons of each measure in the BaU pathway. In the second step, the group members were asked to reallocate the BaU budget according to how they valued the different measures. Figure 6 below shows the original budget allocation and the reallocations of the three groups.

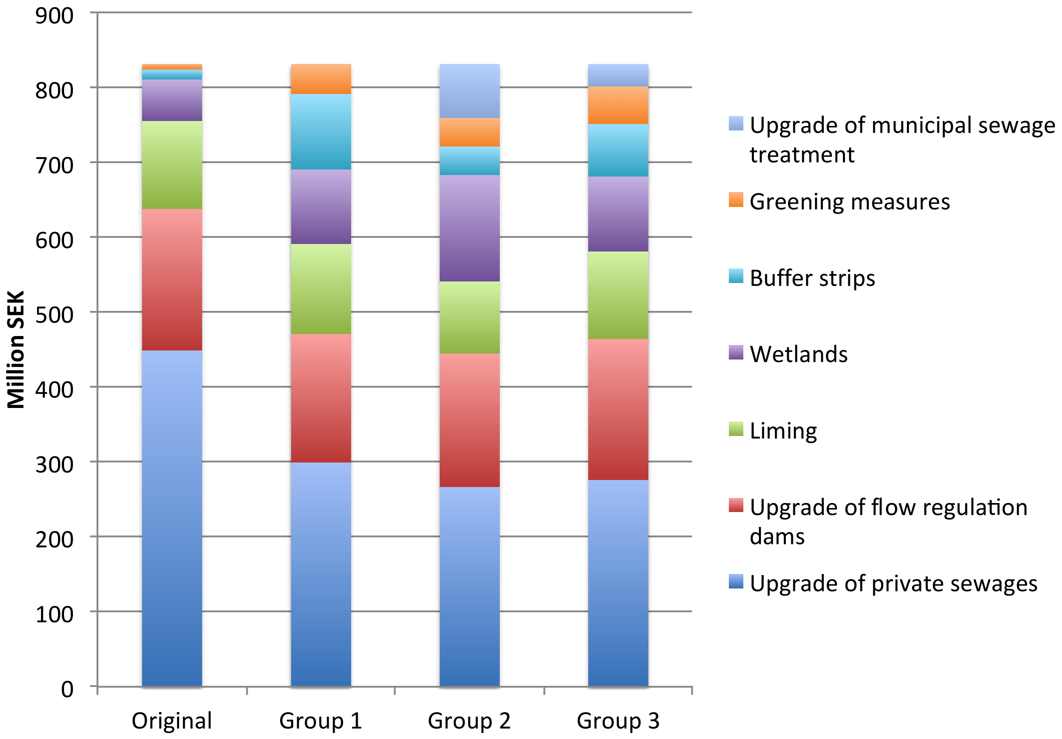

Figure 6. The business as usual pathway in its original form and how the budget was reallocated by the three stakeholder groups.

Some general themes could be identified among all three groups in terms of their reallocations. The most obvious theme is that all groups argue for a reduction of the budget share allocated to upgrade of private sewages. The primary reason for this view is this program is based on the fact that rather blunt criteria are used to select the households that will be mandated to upgrade their sewage system. Consequently, many stakeholders saw this as a not very cost-efficient means of improving water quality. If the program continues, focus should be more on households that located in sites where an upgrade of the sewage system will have the most effect in terms of reduction of nutrient emissions.

Another common theme across all the groups is the increase in the share of the budget allocated to establishment and maintenance of wetlands. The stakeholders emphasized the multi-purpose opportunities of wetlands in that they help slow down water flows, retain nutrients and sediment as well as being valuable in terms of biodiversity. A key question is however where to locate wetlands because both their effectiveness and their cost can vary a lot from site to site, depending on e.g., whether they are located in forests or agricultural lands.

Interestingly, two groups independently of each other added a measure that was not part of the original budget, namely upgrade of municipal sewage treatment plants. It was argued that these tend in general to be in need of both upgrades (to account for “new” issues such as high levels of pharmaceuticals in wastewater) and maintenance of cleaning processes in place.

The measure focused on upgrade of flow regulation dams caused somewhat of a divide between the stakeholders. Some argued that upgrading dams to help restore a more natural flow regime would be very valuable in terms of biodiversity support. At the same time, some stakeholders made the opposing argument that this could in fact destroy biodiversity values by flooding biodiversity-rich grasslands now used for grazing.

The general view on the liming program is that it is seen as an important measure, but that practices in terms of volumes and methods could be adjusted to improve the cost-efficiency of the program.

As for buffer strips, these were generally seen as rather effective and should thus receive a larger share of the budget. One aspect that was highlighted was that buffer strips can be highly valuable in terms of providing recreational areas. Inhabitants in regions dominated by croplands often lack opportunities to stroll away from paved roads, but buffer strips are away to alleviate this.

The measures that are part of the EU greening program were unknown to many of the stakeholders. Those that were familiar with it tended to see it as measure that was heavy in terms of administration but rather lacklustre in terms of helping improve water quality problems in the Helge river basin.

3.3.3. Reda

There are three types of pathways developed for Reda Catchment.

Pathway 1 – Business as Usual – which was defined for all the catchments in the same way – it should consist of all activities, which are being planned for implementation between 2015 and 2030;

Pathways 2, 3, 4 – Three pathways, which were suggested by the moderators of the process in Reda catchment, based on the number of different measures suggested in the consultations with stakeholders. All these measures were simply grouped into three thematic pathways, where pathway 2 was focused on measures in urban areas, pathway 3 was focused on measures in rural areas, and pathway 4 was focused on agro-environmental measures.

Pathway 5 was defined in the third workshop as a selection of the most effective and feasible measures presented in the three earlier defined pathways (2-4).

The following figure depicts the constellation of measures underpinning the different pathways that have emerged in the Reda case study thus far:

Pathway 1: Business as usual

- Wastewater infrastructure - Small WWTP
- Wastewater infrastructure - Septic tanks
- Wastewater infrastructure - Sewerage
- Hydrotechnical infrastructure - Flood protection
- Hydrotechnical infrastructure - Storm sewerage
- Standard agro-environmental measures

Pathway 2: Urban areas

- Urban planning
- Tourist/Recreational areas
- Flood protection infrastructure
- Open Small urban retention infrastructure
- Closed Small urban retention infrastructure

Pathway 3: Rural areas

- Wetlands
- Diffused wastewater
- Large reservoirs
- Small rural retention infrastructure
- Floodplains

Pathway 4: Agro-environmental

- Soil liming
- Greening
- Catch crop
- Buffer zones

Figure 7. Development pathways in the Reda river basin

3.3.4. Selke

Generally, processes in the Selke case study varied from consultations to co-learning. More specifically with respect to the pathway development, stakeholders have taken a pro-active role and driven the process of how the interactions were organized. Excursions to hotspots were organized with the project researchers as a platform to share their knowledge and to expand their understanding of the problem setting and which measures could potentially address the problems. Draft combinations of measures were identified as a future pathway. In this part of the process *co-learning* seemed to have taken place to some extent. Yet, pragmatism was part of the process, too, which could be identified in diverging views in bilateral discussions immediately after the excursions. However, these discussions and draft pathways led to the identification of additional stakeholders which were incorporated into the stakeholder group and then led to revisions of the pathways. The collaboration in the adjustment process was guided by the project partners.

The following figure depicts the constellation of measures underpinning the different pathways that have emerged in the Selke case study thus far:

Pathway 1: Business as ususal

- Flower and water protection strips
- Plowing and cropping techniques on areas with high risk of erosion (direct and mulch seeding, conservation tillage)
- Extensive permanent grassland
- Organic farming
- Ventilation and treatment of mine water and mine water retention
- Dismantling of transverse structures (weir)
- Creation of ecological bypassing options

Pathway 2: Ecosystem service approach

- Conservation tillage pratice
- Different designs and uptakes of riparian strips
- Optimize fertilizer use
- Practice contour farming
- Adjustments to the morphology and characteristics of the streams
- Increase sewage connection

Figure 8. Development pathways in Selke river basin

3.4. The role of the development pathways in transformation towards systemic water governance

3.4.1. Berze

The systemic issue for the Berze river basin was *“to foster functional diversification of the Berze River basin for the benefit of a wider range of private and public beneficiaries”.* The pathways were structured to deal with certain types of environmental pressures and were connected to identified stakeholder groups. While pathways as such are rather stand-alone directions of the work, the most active interactions between stakeholders were in relation to alternative pathways and composition of measures within the pathways. Two examples serve to illustrate the evolution of project thinking and discussions on specific issues.

Pathway 2 - Improvement of the wastewater treatment plants (WWTP) in the Berze catchment was identified in the early stage of the project. Initially, researchers undertook follow-up investigations themselves and consulted different stakeholders on the data about wastewater discharges (volumes, concentrations before and after treatment, etc.), existing standards for waste water treatment as well as the necessity to increase the connection rate of individual households to the centralised systems in settlements. The targeted meeting with municipalities, wastewater treatment companies and other relevant stakeholders was arranged on 11.03.2016. During this meeting, the participants discussed the optimum standards for concentrations at outlet for N and P from small size facilities. Such standards are not set for the plants below 2000 p.e. Therefore, it was proposed to estimate the effect on the pollution load and concentrations in surface water if HELCOM recommendations 28E/5 and 28/6 would be implemented. As many of the WWTP are treating a large volume of rain and ground water infiltration, another scenario was defined to estimate the resultant effect on the system without any excess water infiltration.

During the second common workshop (10.03.2017), stakeholders provided the feedback that proposed measures are irrelevant for all municipalities. Considerable investments have already been allocated in the last 10 years to WWTP improvements and that further up-grading of these facilities is not feasible. Based on discussions at the workshop three out-dated and under-performing facilities were proposed to be included in the WWTP pathway which includes the construction of new treatment facilities and the replacement of waste water collection pipes in two facilities. This proposed pathway is the basis for the cost-effectiveness assessment that will be presented in an upcoming common stakeholder workshop in June 2017.

Pathway 3 - Ecological buffer strips was identified as one of the most appropriate supplementary agri-environmental measures during the *first common stakeholder workshop (25.09.2015)*. Timing of the inception of MIRACLE coincided with the work on second RBMP and elaboration of amendments for the Law on Protection Belts to redefine buffer strips along water courses (autumn 2015-winter 2016). Therefore, stakeholders proposed to researchers that the MIRACLE project should work on the “buffer strips” including their effects and costs.

Initially the proposal as included in the 2nd RBMP 2016-2021 was taken-up by researchers. The proposal aimed at establishing 2m wide buffer strip along water streams, lakes and ditches. Tillage, fertilizer application, use of pesticides and growing of crops would be prohibited. The draft amendment of the law aimed to establish only a 1m wide buffer strip along ditches. Unfortunately, the proposed amendment was rejected by the Parliament in March 2016 due to insufficiently demonstrated costs and benefits for the proposed changes.

During the target group meeting between researchers and representatives of the agriculture sector (29.04.2016), implementation of the buffer strips was reviewed in context of the greening measures. A stakeholder commented that farmers do not apply this measure on a broad scale due to unfavourable payment conditions.

The key interaction among the researchers and stakeholders focused on the most appropriate design of the buffer strip. Therefore, a written survey was undertaken to obtain additional insights on the effects and management needs of buffer strips. The main aim of the survey was to enhance the design and function of buffer strips. As a result, 2 alternatives were outlined: a) 10m wide buffer strip along natural water bodies and 2m wide buffer strip along ditches; b) 5m wide buffer strip along natural water bodies and 2m wide buffer strip along ditches. Both scenarios were modelled and presented at the *second common workshop on 10.03.2017*.

Participants provided feedback on the proposals and highlighted that the buffer strip measure should not only be targeted to reduce nutrient pollution, but also serve the function of biodiversity protection. Therefore, the management practice of buffer strips needs to be well-defined, e.g. season of grass cutting to ensure natural seed dispersal and maintenance of highly valuable grasslands.

Costs-effectiveness of the ecological buffer strip measure will be presented at the next common stakeholder workshop in June 2017.

3.4.2. Helge

Forestry is perceived as an underrated issue connected to brownification. Since 70% of land cover in river Helge is forests, it is of great importance to generate solutions for improvements. The workshop critiqued the narrative behind the formulation of the alternative pathway on sustainable water management in forests. In particular, the need to address overarching issues connected to change in the forest production was highlighted as important. As an example, the shift to deciduous forest also needs to address the economic model connected to forest production in which such a major shift also need to be reflected in the regulatory framework, subsidies and financial model linked to forest production.

In Helgeår, brownification was clearly an issue that reflected the interests of a broad set of stakeholders. It was an organization principal in various stakeholder interaction, but stakeholders were also asked to identify other strong stakes in the same meeting, and resultant interconnection with the systemic issue. Scientists from the Miracle consortium presented information in the attempt to support co-learning with stakeholders in most of the meetings, but this was very nutrient centered. Thus, rather than adding value, the scientific input seemed to disempower the stakeholders. One of the alternative pathways was developed by the case study leader and the other pathways grew out of a vision identified in a meeting with foresters.

3.4.3. Reda

The three alternative pathways, which were grouped and defined by the moderator consist of the complete list of the measures suggested by the different stakeholders. It is impossible to conclude, that they reflect the common vision of the stakeholders. However, Pathway 5, which was selected during the third workshop by the stakeholders really show a common vision of the stakeholders. During this workshop, the participants were divided into three groups. Each group has discussed the most effective measure for the pathways 2-4. Surprisingly, all of the three groups reached very much similar conclusions. Therefore, the fifth pathway can be considered as an illustration of the common vision of stakeholders.

3.4.4. Selke

At the beginning of the stakeholder engagement process in the Selke diverging “world view” of the problem settings and their relevance dominated the nature of the interactions. This was also reflected in how participants seated themselves in the meeting - according to their “sectoral view”. The interaction and co-reflection led to an acknowledgement of the different views of the problem settings and a more open discussion and willingness to find solutions for all stakeholders. E.g. biodiversity stakeholders acknowledged that the degree of resulting land use changes in new measures need to be considered and the provision of multiple services requires a fair and realistic remuneration of services (which is currently not the case), while representatives from the farming sector supported measures which tackle agricultural pollution (in contrast to early statements that there hardly is a problem). Again, the changes in stakeholder perspective throughout the engagement process was reflected in the seating arrangement from the second meeting onwards when it became mixed rather than sectoral. The sectoral separation vanished. During the stakeholder interactions, a joint interest of improving the cost-effective delivery of measures emerged and supported the development of the alternative pathways.

4. THE BUSINESS AS USUAL APPROACH FOR WATER GOVERNANCE AND ITS CORRESPONDENCE WITH INTERESTS AND PATTERNS OF AGENCY IN THE CASES

Part 4 supports the analysis of the results from an ordination analysis applied to empirical data from the case studies that describes (1) stakeholder perceptions of the relevance of existing measures implemented in the respective catchments and (2) the degree of agency postionholders have in regards to the implementation of different measures. This analysis will in turn supports answering the higher-level question: *"How aligned is the business as usual approach (up to 2020) for water governance with the interests and the pre-existing pattern of agency within the MIRACLE's respective cases?".*

The results below have been supported by an ordination analysis. A correspondence analysis is a non-linear form of ordination. It is a technique that has emerged out of community ecology in order to organise community data on species abundance. It is not a form of statistics i.e., in case the quest to elicit the most significant gradient in determining the variation in species abundance. This would require an additional step. In short, ordination analysis organises a multi-dimensional input, namely in the MIRACLE case (1) a multi-dimensional plot is made up of numerous measures each having a unique combination of stakeholders with a material interest connected to its functionality and; (2) a multi-dimensional plot made up of numerous measures, each having a unique combination of positionholders that hold different degrees of agency.

The output from an ordination plot is two dimensional which allows for interpretation. Most of the variation is normally explained in the first two axes and normally they are depicted as a scatter plot (see results section) which provides a transparent output that is presently supporting a co-enquiry process in the case studies. The interpretation of the ordination output allows for interpretation of the similarity and dissimilarity of stakeholders' perception of measures; and the similarity and dissimilarity of positionholders' level of agency in relationship to different measures.

The plots that appear in this chapter have been produced from data sets based on empirical insights gained through participant observation within the social learning process, and via insights gained from the policy analysis undertaken by MIRACLE researchers in the respective cases. These scatter plots will be used to support the technical translation of first order data into second order knowing; whereby stakeholder and positionholders can contest technical orders and others systems of interest. It is envisaged that the *stakeholders interest in measures* plots will contribute to surfacing additional synergy and reformulation of the pathways. Moreover, the plot depicting the degree of agency positionholders have over the implementation and adaptation of respective measures is intended to support the emergence of enabling governance configurations. The plots will be used to facilitate this process at MIRACLE's cross-case workshop in Norrköping, Sweden. Case study leaders from MIRACLE have done a preliminary interpretation of the plots and this appears in the results section below.

4.1. Results from Berze

4.1.1. Diverging stakeholder interests in Measures in Berze

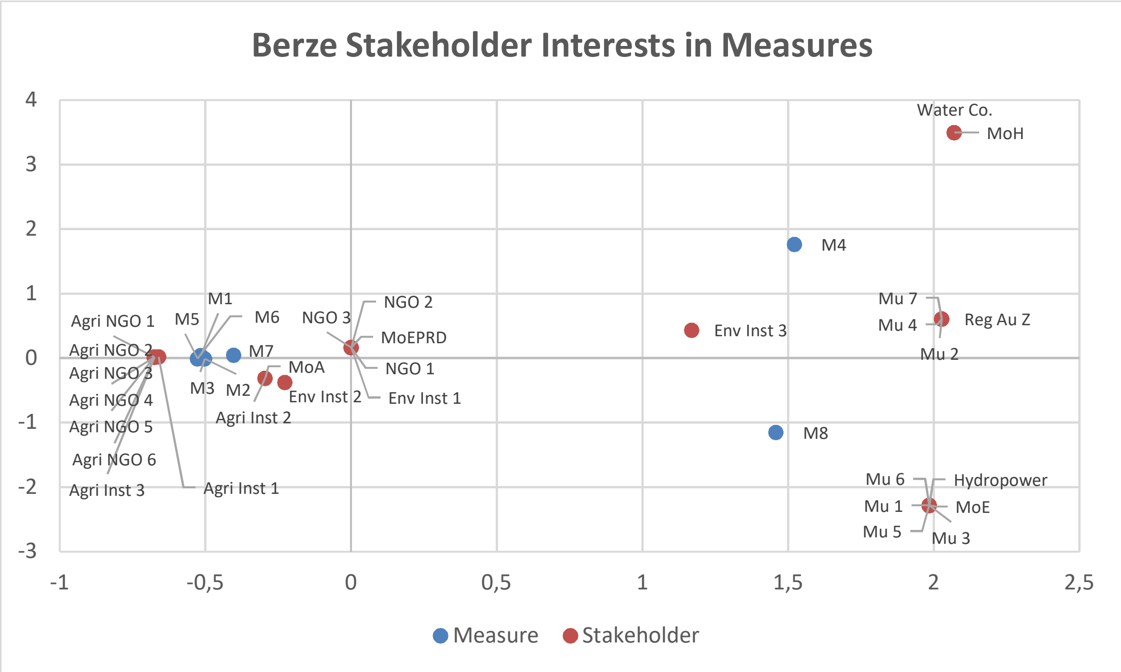

Figure 9. Results Depicting Stakeholder Interests in Measures in the Berze case study. Measures (M1-M8) are explained in Table 3.

Table 3. The measures examined in the Berze

Measure	Description
M1	Greening measures (ecological focus areas, crop diversification, permanent grasslands)
M2	Agri-environmental measures (biodiversity preservation in grasslands, ecological horticulture, maintenance of stubble cover during winter period)
M3	Organic farming
M4	Upgrade wastewater treatment plants
M5	Ecological buffer strips
M6	Sedimentation ponds
M7	Reduced fertilizer application
M8	Fish-ways installed on 5 Small Hydro-Electric Plants

Business-as-usual measures M1, M2, M3 and Agri-Environmental measures M5, M6, M7 are all related to the agricultural sector and are clustered tightly. The same stakeholders have a positive stake in these measures and form a cluster around these measures. From the national government side these stakeholders include planners and supervisors from: Ministry of Environmental Protection and Regional Development, Latvian Environment, Geology and Meteorology Center, Ministry of Agriculture, Nature Protection Agency and Rural Support Service. The Real Properties of the Ministry of Agriculture and State Environment Service, Jelgava Regional Environmental Board has an interest in all agri-environmental measures. The Latvian Rural Advisory and Training Centre has an advisory role in all of the agricultural measures. The agricultural interest organizations, namely the Farmers Parliament, Latvian association of organic farming, Latvian agriculture cooperative association, Latvian Farmers federation, Farmers association of Jelgava and the Farmers association of Dobele and the environmental NGOs

Environmental Protection Club, Latvian Fund for Nature and the Latvian angler's association have a positive stake in all of the agricultural measures.

The waste water treatment plants (WWTP) cluster includes the following stakeholders that have a positive interest in the improved waste water treatment measure (M4): Ministry of Health, the Water Enterprise, three municipalities and one regional authority for which the WWTP is a relevant measure and the State Environment Service, Jelgava Regional Environmental Board that supervises the WWTP measure.

The Hydro-electric Plant measure (M8) cluster is composed of six stakeholders having positive interest in this measure – the Ministry of Economics and the Hydropower association and 4 municipalities.

4.1.2. Concentration of agency in relationship to measures in Berze

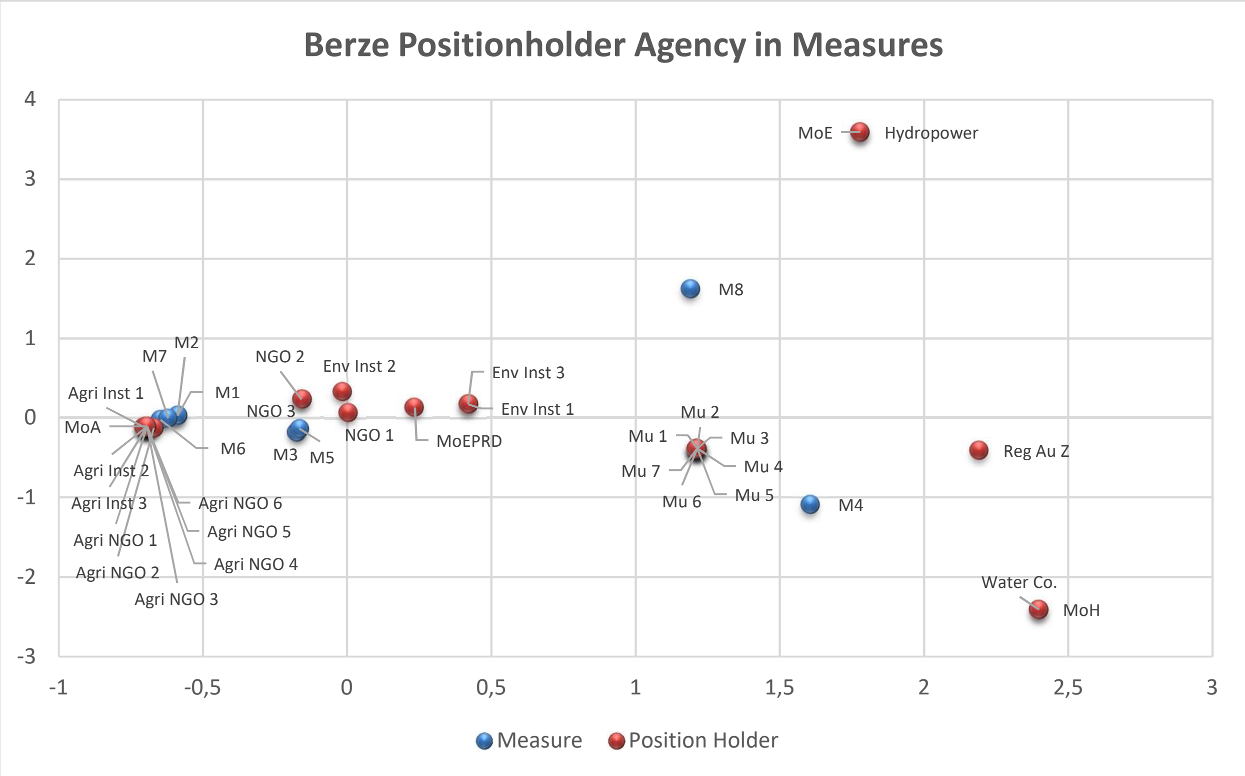

Figure 10. Results depicting positionholder agency in terms of Measures in the Berze

As the Berze case pathways are sectoral in their composition, the agency plot displays clustering of measures and stakeholders but not as distinctly as for the interest plot. The Business-as-usual measures and the Agri-Environmental measures form a dense cluster but WWTP measure M4 to a lesser extent. The Hydro-electric plant measure M8 forms somewhat of an outlier with fewer stakeholders being located in close proximity. The agency plot displays a closer spatial relationship between the measures as well as a somewhat greater merging of the stakeholders.

4.1.3. The dominant worldview underpinning the business as usual in Berze

The dominant world view in Berze is nutrient centered and views transformations within the agricultural sector as the means to tackle it. However, there is a degree of ambiguity within the "world view" as the RDP and RBMP are situated within a multi-level governance structure and are influenced by actors from multiple sectors with different values and objectives. Both policy frames are driven top-down by the EU - the RDP predominantly by economic agricultural interests whereas the RBMP is driven by environmental water resource interests. The agenda of the RDP is supported by significant designated funding whereas the RBMP largely lacks resources to implementation.

In Latvia, the Common Agricultural Policy (CAP) or RDP are viewed very pragmatically – as a vehicle for meaningful supplemental support revenues for farmers and landowners in rural areas. RDP environmental objectives are of importance and can be furthered if they can be aligned with agricultural objectives. In Latvia, the RBMP has a significantly lower legal status when compared to the RDP and as it lacks earmarked EU funding its influence on environmental and agricultural policy is greatly diminished. As Latvia is characterized by a small population and in various surveys is rated as a "green" country, measures going beyond the "business as usual" need to be clearly justified and demonstrated.

Preliminary findings from the ordination analysis suggest that there is close correspondence between the interests and agency configurations and the business as usual as orchestrated by the CAP/RDP. The pattern from the scatter plots also suggest that the sectoral policy environment is reproduced as distinctly sectoral constellations of stakeholders and postionholders.

4.2. Results from Helge

4.2.1. Diverging stakeholder interests in measures in Helge

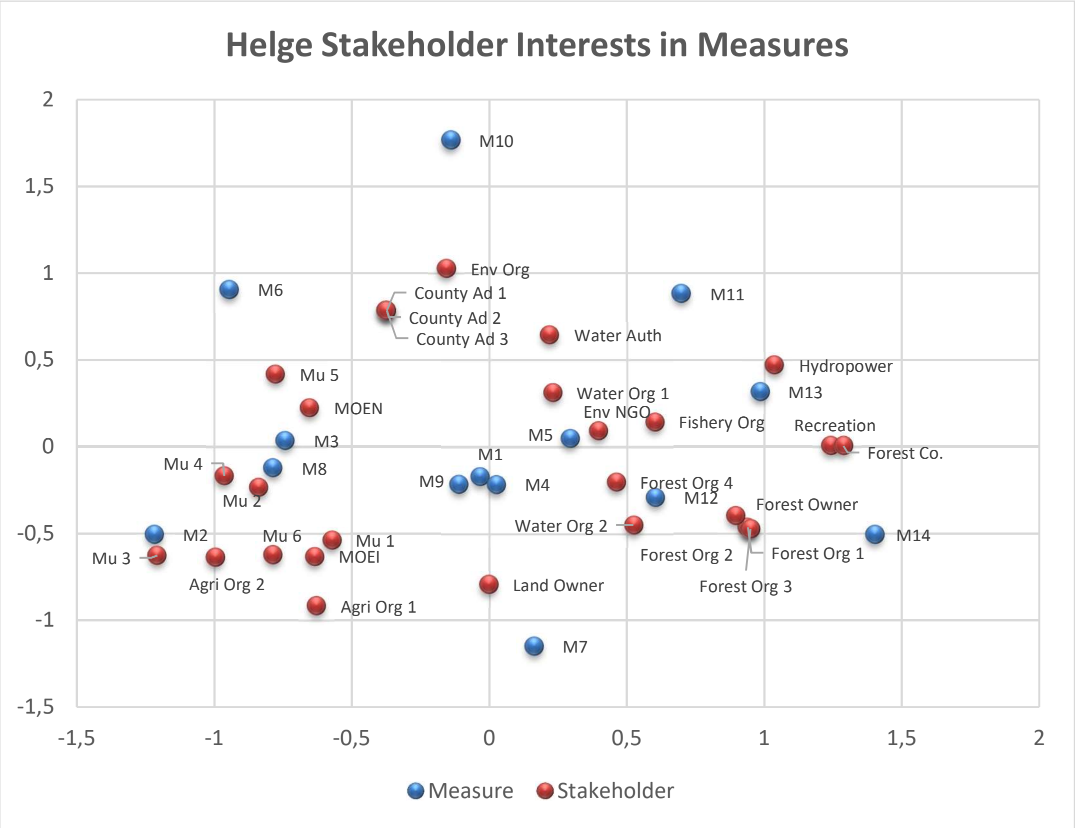

Figure 11. Stakeholder Interests in Measures in the Helge case study (also see table 4).

Table 4. The local measures consider in the Helge Case study

Measure	Description
M1	Liming (by air, by doser, by boat)
M2	Buffer strips. Non-productive field margins in agricultural landscape (included in greening program)
M3	Upgrading of private sewage treatment systems
M4	Established Wetlands
M5	Upgrade/removal traditional water regulating dams
M6	Storm water ponds
M7	Floodplains targeting agriculture production areas
M8	Riparian zones in agricultural landscape
M9	Wetlands
M10	Biomanipulation removal of fish
M11	Remeandering
M12	Alder Swamp Forests
M13	Riparian zones in forest landscape
M14	Transition from coniferous to broadleaved forest

County administrations are situated far away from municipalities. This corresponds to dilemmas presented in the consultations whereby municipalities are disconnected with the process in the identification of measures. In river Helge, that has resulted in a number of measures identified that are not supported at the local level including, buffer zones upgrade of water regulating dams. Furthermore, measures prioritized locally such as storm water ponds, flood plains, wetlands in forest areas etc. are not part of the planning process of measures at the regional and national level.

Those measures appearing in the centre of the plots, liming and wetlands, correspond to broader issues shared by stakeholders at all levels as well as several of the different sectors consulted such as changes in PH and envisioned benefits of wetlands to biodiversity and tourism, nutrient reduction and low PH levels in mid and upstream areas.

The plot also shows how formal measures are situated closer to the center, whereas new measures such as flood plains, change from coniferous to broad-leaved forest are measures disconnected from the mainstream.

Other interesting insights include the position of measure in greening program common to most stakeholders in the agricultural sector is not perceived as a priority measure.

4.2.2. Concentration of agency in relationship to measures in Helge

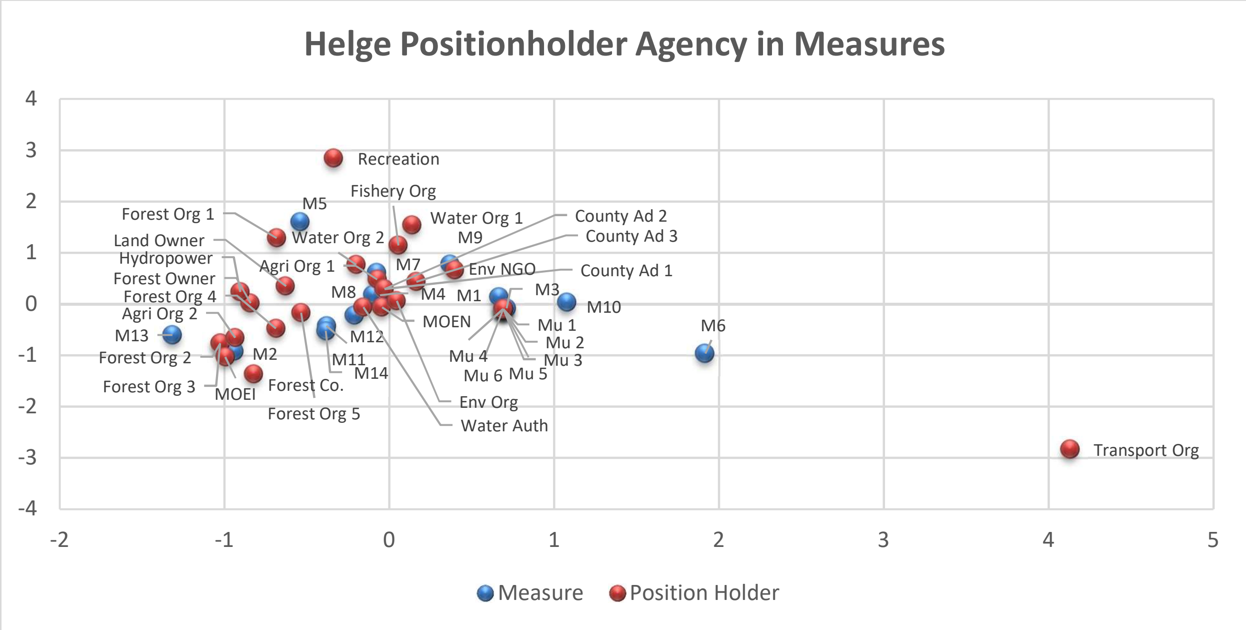

Figure 12. Positionholder Agency in Measures in the Helge case study

Recreation is disconnected which shows that a lot of the other stakeholders and measures do not share the same goals as the tourism sector. As a result, measures with potential to contribute to the tourism sector may not contribute using the full potential.

The County administration has greater agency in relation to different measures in comparison with how they are positioned in the image about interest.

The Hydropower industry seems to have greater agency than interest.

The Water authority is a key positionholder in the process of identifying and implementing measures and has a high degree of agency, but less of an interest.

4.2.3 The dominant worldview underpinning the business as usual in Helge

The establishment of five water delegations in Sweden situated at the regional level (as opposed to National level) means that the program of measures is decided by an authority that is not situated at the National level. The institutional set up challenges the traditional hierarchical structure in policy development and implementation where in this case a regional agency is the decision maker and other authorities and municipalities are the implementers. The Water Framework Directive (WFD) with its ambition of a bottom up approach has challenged the traditional hierarchical top down policy process.

The consultation with stakeholders in River Helge shows that the expected communication between different authorities was more difficult than expected. It emerged that the cooperation did not work well in the design of program of measures. In a recent report assessing the implementation of the WFD in Sweden (Michanek et al 2016), the authors highlight the issue of legitimacy as an area of concern and continues to argue that in the interviews with officials at a national, regional, and municipal levels for their report there was a generic perception that authorities find it difficult to accept decisions from “below”, especially the decisions of regional water authorities. The authors explain that most State authorities do not consider that they should be governed by "regional" authorities, perceived as beneath them in the state hierarchy. As a result, the program of measures is perceived as lacking full legitimacy. Many national authorities, such as the Swedish Board of Agriculture, consider that if they should take measures to improve water quality as suggested in the program of measures under the WFD that should instead be included in appropriation direction (regulatory letters) issued by the Ministry of Enterprise and Innovation that stipulates the expected direction of work for the Board of Agriculture.

Another area of concern expressed by both state officials and representatives of municipalities is the classification of water bodies that provides the baselines for selecting and identifying measures is done. Authorities have been asking questions about how different classifications have been made and shared that they had expected a more inclusive process where representatives and experts from different water basins would have been consulted in the process of classifying water bodies.

Environmental quality standards are of great importance in Sweden and provides important tool to link program of measures with local development plans. BONUS MIRACLE has shown that there remains a gap in terms of how the environment quality standards are used in the design and evaluation of the program of measures.

An important ambition with the WFD is the focus on local anchoring and recognition of contextual features of different River Basins. In Sweden, the government has according to the WFD created a new institution called water board. In River Helge, the water board represents 13 municipalities as well as 4 key sectors including forest, agriculture, tourism and urban communities. The MIRACLE interaction and consultation with the water board reveals that despite efforts by the water board to spread knowledge, encourage local participation and initiate projects, their role is still unclear to many within the water governance system. They have not had a formal role in the design and planning of program of measures, they do not have a clear mandate and it is up to the 13 municipalities to secure resources, but the need to do so has not been communicated from the water authority (that does not have the mandate to order the municipalities). As a result, the current system risks enhancing existing power relations instead of ensuring a true inclusive and participatory process. The worldview underpinning the business as usual (BAU) thus reflects a shaky institutional setup where the basic legitimacy of the content is questioned from above and below.

4.3. Results from Reda

4.3.1. Diverging stakeholder interests in measures in Reda

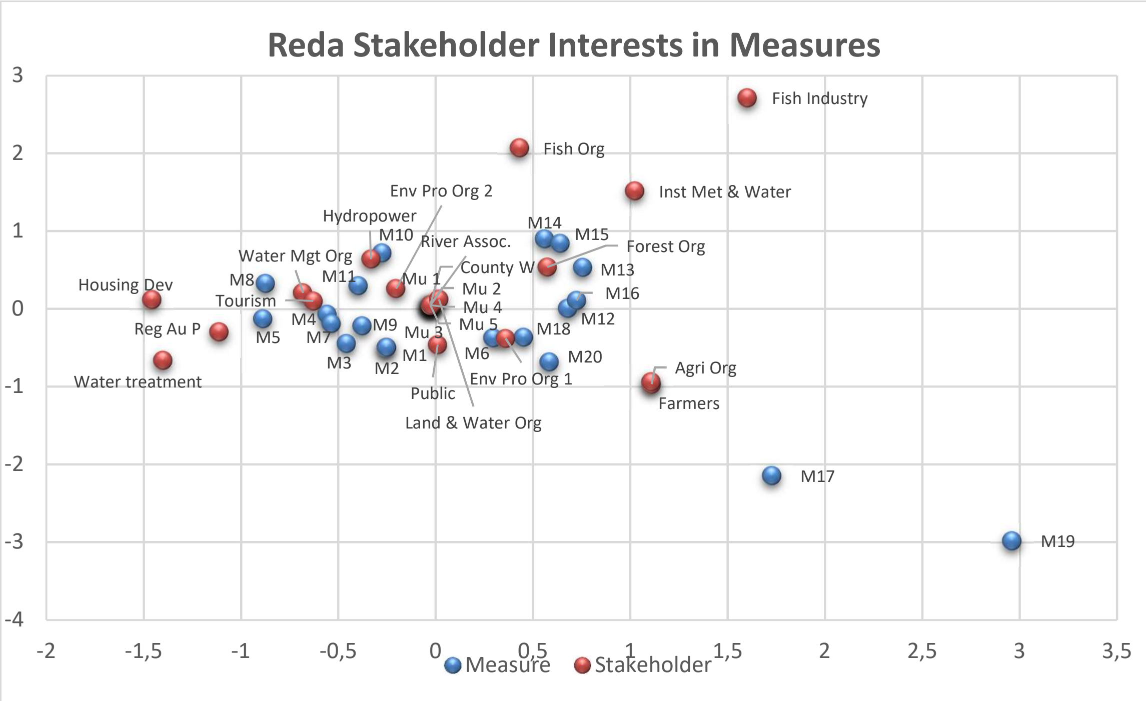

Figure 13. Stakeholder Interest in Measures in the Reda case study (also see table 5)

Table 5. The measures considered in the Reda Case

Measure	Description
M1	Wastewater infrastructure - Small WWTP
M2	Wastewater infrastructure - Septic tanks
M3	Wastewater infrastructure - Sewerage
M4	Hydrotechnical infrastructure - Flood protection
M5	Hydrotechnical infrastructure - Storm sewerage
M6	Standard agro-environmental measures
M7	Urban planning
M8	Tourist/Recreational areas
M9	Flood protection infrastructure
M10	Open Small urban retention infrastructure
M11	Closed Small urban retention infrastructure
M12	Wetlands
M13	Diffused wastewater
M14	Large reservoirs
M15	Small rural retention infrastructure
M16	Floodplains
M17	Soil liming
M18	Greening
M19	Catch crop
M20	Buffer zones

Regional and County administrations are situated close to the municipalities. They are also close to the majority of measures defined (M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, M18, M20).

Housing development and water/wastewater sector are slightly isolated from the main cluster of the stakeholders/measures, which may indicate different interest of these two stakeholder groups. Fish industry and angling organizations are significantly separated from the rest of stakeholders/measures, which indicate that their interests may differ from the others. Also, farmers and agricultural organizations can be clearly identified outside of the main cluster, which may indicate their different interest from the others.

The two measures M17 (Soil liming) and M19 (Catch crop) are located far away from the majority of stakeholders, but relatively close to the agricultural organizations and farmers. This may indicate, they are priority measures for agriculture sector, but far from the interest for the other stakeholders. As this may be easily explained for the measure M17 (Soil liming), which has mainly impact for agriculture (increased soil productivity), it is less clear why the measure M19 (Catch crop) is so much less interested for other stakeholders, as it has clear impact on reduction of water and nutrient flow from arable land.

4.3.2. Concentration of agency in relationship to measures in Reda

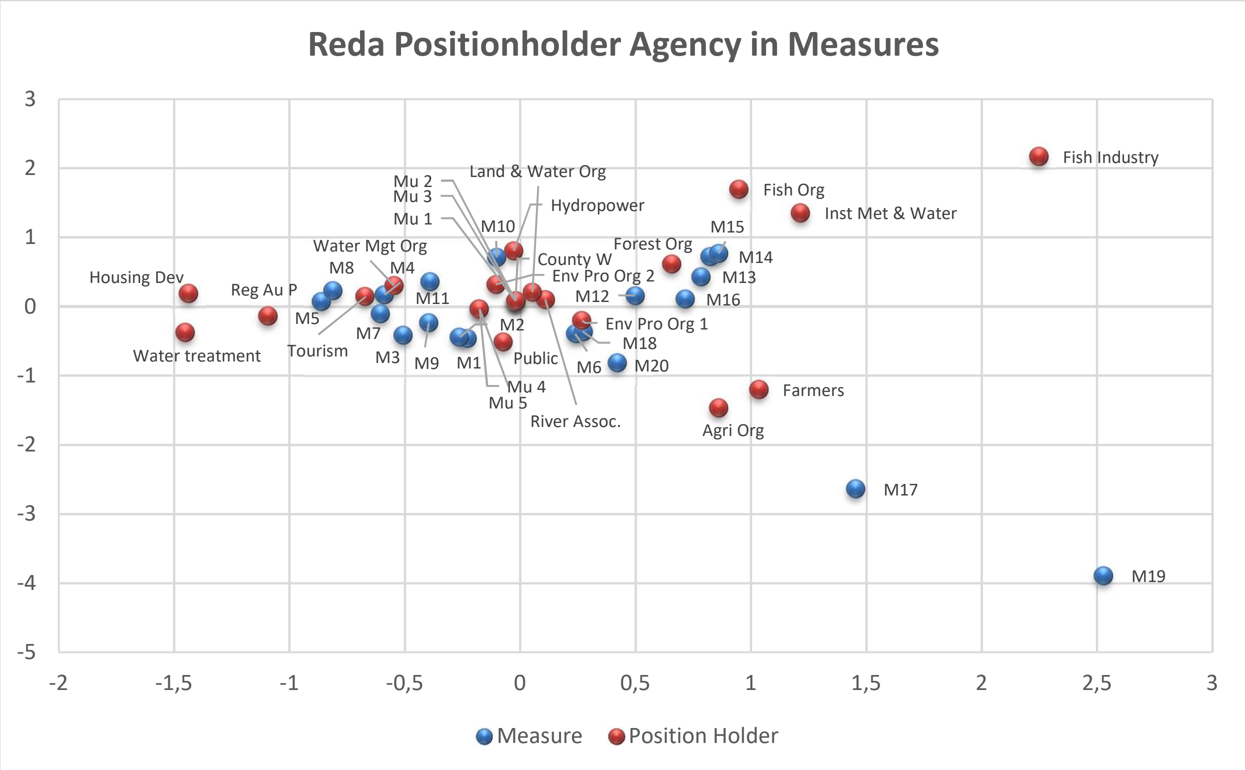

Figure 14. Positionholder Agency in Measures in the Reda case study

The plot of the agency (mandate) and interest are very similar (although not identical). Regional and County administrations are situated close to the municipalities. They are also close to the majority of measures defined (M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, M18, M20), which indicates that they have not only interest, but also agency in these measures.

Housing development and water/wastewater sector are slightly isolated from the main cluster of measures, which may indicate lower agency of these two stakeholder groups. Angling organizations are slightly separated, but fish industry is significantly separated from the main measures, which indicate that their agency differs, and the agency of fish industry is much smaller than angling organizations. It is also clear that the Institute of Meteorology and Water Management has low agency in the implementation of measures. Also, farmers and agricultural organizations are more separated from each other and can be clearly identified outside of the main cluster, which may indicate their lower agency in measures outside the agricultural sector.

The two measures M17 (Soil liming) and M19 (Catch crop) are located far away from the majority of stakeholders, but relatively close to the agricultural organizations and farmers. This may indicate that they are priority measures for the agricultural sector, but far from the agency for the other stakeholders. This conclusion is true also for other agro-environmental measures (M18, M20), which is however not so strongly indicated in the plot above.

4.3.3. The dominant world view underpinning the business as usual in Reda

The dominant world view in Reda is focused on flooding and water quality. However, stakeholders indicated that flooding is the main (systemic) issue for them.

RDP (Rural Development Program), WEP (Water and Environmental Program) and FPP (Flood Protection Program) are the basis for activities included in the business-as-usual pathway. There are many additional documents, which are important in defining measures in this pathway such as: Water Law, Construction Law, Environmental Protection Law and Regulations of the relevant Ministries. Each of the above policies or documents come from different governance sectors and identifies different budgets to finance specified measures. The main objective of the RDP is to improve the competitiveness of agriculture, sustainable management of natural resources and climate actions and the sustainable territorial development of rural areas. The goal of WEP is protection and management of water resources in Poland, which is strongly linked to the implementation of the Water Framework Directive. FPP reflects the issues related to flood prevention and management in accordance with Flooding Directive 2007/60/EC. RDP is financed by the European Agricultural Fund for Rural Development, but WEP does not have its own budget and funds can come from several sources as EU funds, National Fund for Environmental Protection and Water Management or at the regional level within the Voivodship Fund for Environmental Protection and Water Management. FPP also does not have its own budget. Within the FPP is possible to apply for funding from various programs and sources.

4.4. Results from Selke

4.4.1 Diverging stakeholder interests in measures in Selke

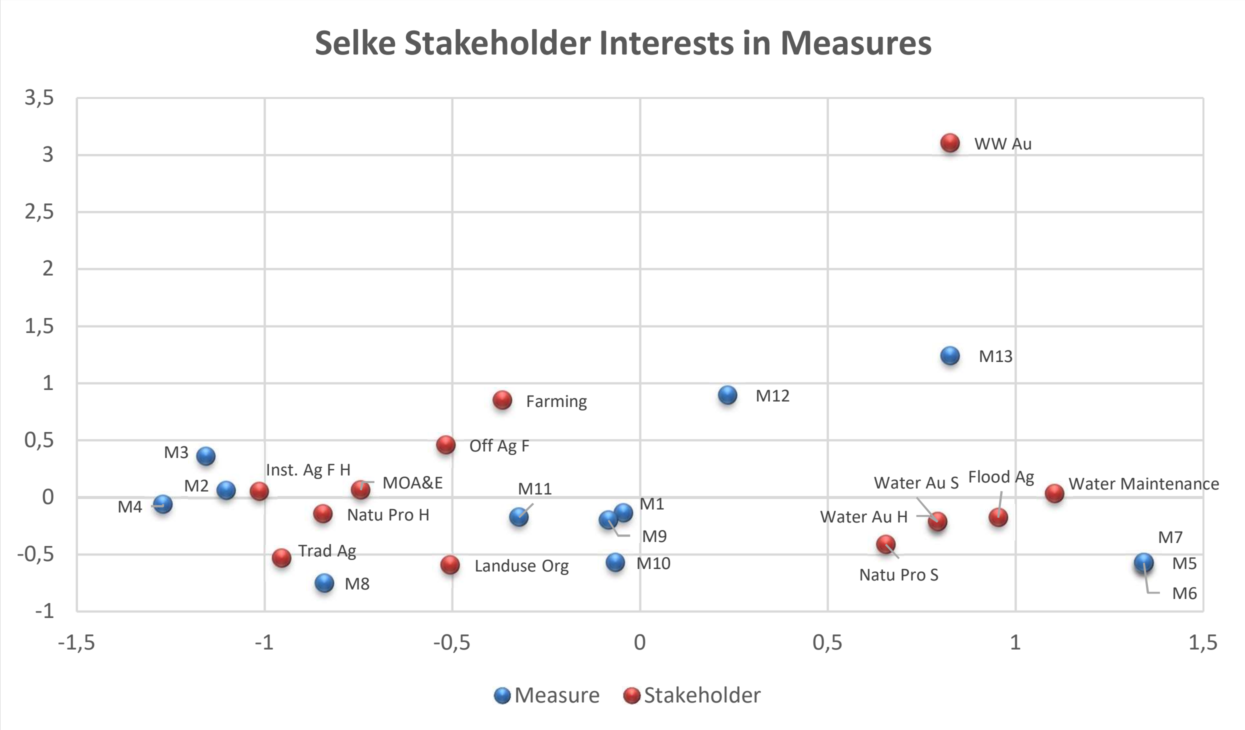

Figure 15. Stakeholder Interest in Measures in the Selke case study (also see table 6)

Table 6. The measures considered in the Selke case

Measure	Description
M1	Flower and water protection strips
M2	Plowing and cropping techniques on areas with high risk of erosion (direct and mulch seeding, conservation tillage)
M3	Extensive permanent grassland
M4	Organic farming
M5	Ventilation and treatment of mine water and mine water retention
M6	Dismantling of transverse structures (weir)
M7	Creation of ecological bypassing options
M8	Practice conservation tillage
M9	Different designs and uptakes of riparian strips
M10	Optimize fertilizer use
M11	Practice contour farming
M12	Adjustments to the morphology and characteristics of the streams
M13	Increase sewage connection

While the lower water authorities of the two different counties are very closely aligned and part of a cluster with the water-related measures, the two nature protection authorities differ in their position. This is interesting and reflects slightly different positions voiced by those two stakeholders with the "Natu Pro H" which exhibits greater consideration of agricultural interests including a fair remuneration for delivering ecosystem services. The "Natu Pro S" paid less consideration to agricultural interests.

The position of the farmers union with respect to the different measures is interesting. It seems to be more distanced from the agri-environmental measures than "Offices of Ag. Land Forestry" and "State Ag. F Hort". This reflects a general position of the farmers union that measures which impact less on land use are preferable.

4.4.2. Concentration of agency in relationship to measures in Selke

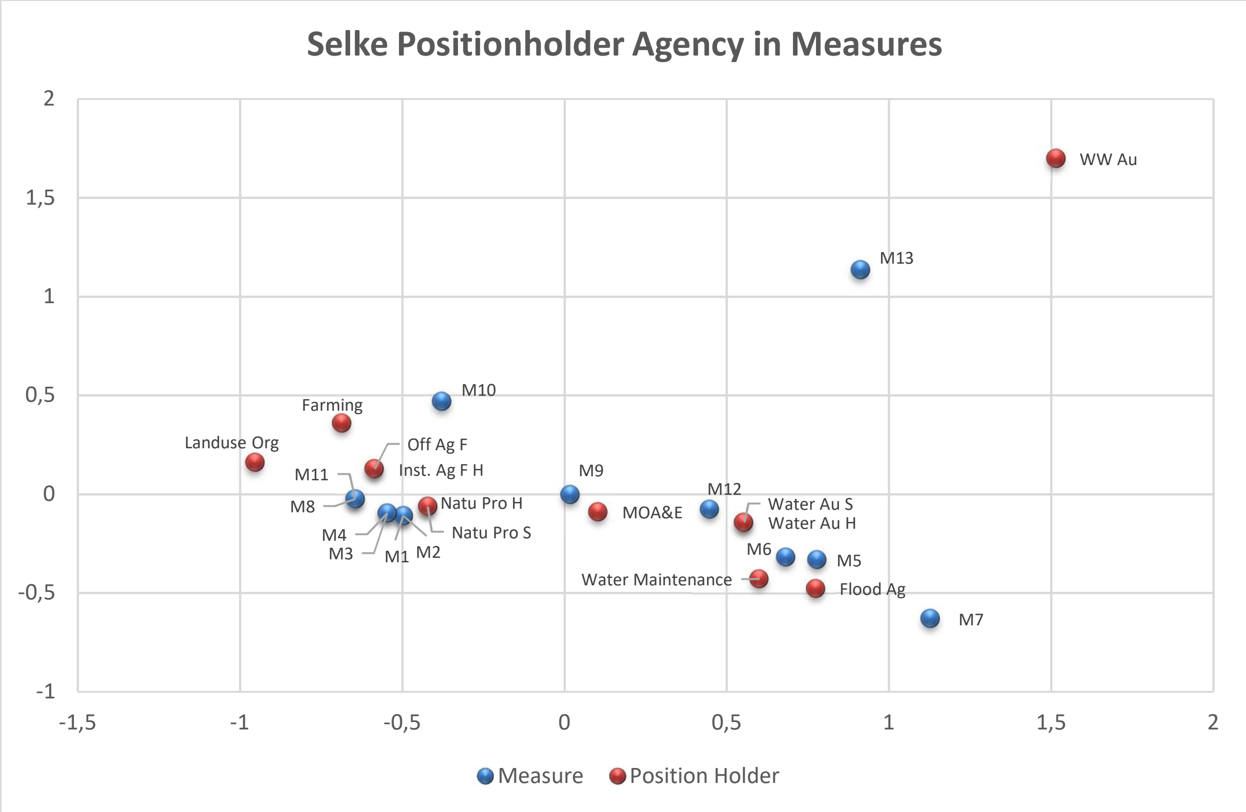

Figure 16. Positionholder Agency in Measures in the Selke case study

The agency graph provides a more consistent picture of two clusters: 1) agricultural and nature protection cluster; 2) water cluster. The wastewater stakeholder (WW Au) is the outlier with very few linkages to other measures. An interesting difference to the other graph is the position of the nature protection authority of the Salzlandkreis (Natu Pro S), which here shows greater agency in relation to agri-environmental measures.

It is also interesting that the central position of the new design of riparian strips, which is a good reflection of the nature of the measure integrating agricultural, biodiversity and water-related interests.

Moreover, the position of the Ministry between the two clusters, maybe (theoretically) indicates some kind of mediation role. But this position might well be a reflection of the specific person involved from the Ministry who has close ties with the water state agency.

4.4.3 The dominant world view underpinning the business as usual in Selke

The world view in the Selke case study is rather nutrient and water quality centred. Stakeholders used their interpretation of existing issues in water quality, and the drivers impacting on water quality, as key criteria in the identification of relevant measures in the BAU pathway. Different drivers and sources of water pollution were highlighted by different stakeholder groups. Agricultural stakeholders highlighted point sources as a major factor, while at least some of the water-related stakeholders identified agricultural land use as a main source for problems with water quality. Not surprisingly the world view of agricultural stakeholders was more driven by economic aspects of agricultural land management. Further reflections of the stakeholders highlighted related biodiversity issues closely linked to the identified problems and issues in relation to water quality. Biodiversity emerged during the first discussion as a common topic of interest for agricultural and water-related stakeholders. The revisions of the stakeholder group, implemented to better cover biodiversity related issues in the discussion, shifted the world view of the group to a wider environmental emphasis. The composition of the measures identified in the BAU pathway mirror the close linkages between nutrient and biodiversity related issues with a slightly bigger share the resources spent on measures with a primary objective in relation to water quality.

5. RECONCILING STAKEHOLDER INTERESTS VIA THE SOCIAL LEARNING PROCESS IN MIRACLE

A general insight that has emerged during the social learning process is the difficulties faced by the modelling and cost benefit work packages in producing first order data that provides insights that have local relevance for stakeholders. The models at hand, the most complete and rigorous data sets and the disciplinary home of the modeller is aligned with the status quo. In fact, rather than supporting a transformation cycle that should lead to more systemic governance transformations, in some instances project input appears to have slipped back into the normal scientific mode of reproducing status quo (business as usual). In other words, the first order data inputs from the project thus has not supported a transition from the “redefinition of pathway” phase (point 6). This can be attributed to the project’s aim of forging a double-edged sword; an instrument that both performs in addressing multiple local demands whilst also attending the regional issue of nutrient enrichment in the Baltic Sea. This has led to a situation of cognitive dissonance between those researchers within the consortium that are focused on generating first order data that supports the regional level issue and the case study stakeholders. This dissonance has, in some instances, led to high degrees of confusion (state 3) during the learning events, exposing the transformation cycle to a risk of once again slipping back into the status quo. We have seen instances of 4, 5 and 6 in the learning processes but this is not on account of our data input (first order data) but rather because we have provided a platform for new constellations of stakeholders to come together and draw on their own experiences to engage in a process of second order knowing.

As we are now developing a process design for the cross-case workshop that is intended to support learning that paves the way for emerging governance innovations, we need to carefully consider the lessons that have emerged thus far in terms of our inputs as a project. For example:

1) The modelling WP can only provide catchment/basin level (not local) insights into the performance of measures in reducing nutrient enrichment under. This is important for the overall research project, as we are looking for better approaches to tackle nutrients at the BSR level. However, this input is not useful to support learning within the cases or even cross case learning. Case level stakeholders, in general, are not interested in learning about how different measures perform in reducing nutrient enrichment at basin/catchment level (with the exception of Berze perhaps since it appears that the systemic issue was not used to orchestrate the learning process with stakeholders). Rather they are interested in the “local effects” of measures in terms of addressing the systemic issue and other demands. At the case study and cross case levels, stakeholder learning should be supported by inputs that lead to an understanding of

performance of innovations that address the multiple demands of stakeholders in these local settings. However, at the BSR level, our lessons suggest that modelling will be an important input to the learning (at the BSR workshop), where the stakeholder's system of interest is supported by governance innovations that address nutrients.

2) Flowing from the above, we have also seen that the initial input of cost effectiveness data in the learning process also leads to the reproduction of the status quo as it was just in relation to nutrients. The scope of the analysis has now been increased to cover multiple costs and benefits reflecting the multiple demands of the stakeholders. Because this input has come very late in the process, it will probably be necessary for one more iteration of stakeholder learning in the case studies. We envisage that the Cost-Benefit work package will have valuable input in the cross case with its broadened scope.

3) The degree of correspondence between the business as usual pathway and the stakeholder defined pathways in the respective case studies provide insights into diverging interests and positions in terms of discrete measures. Findings suggest that in Helgeår, the constellation of measures embodied in the pathways diverge significantly from the business as usual pathway. This concurs with results from interviews conducted earlier in the project which suggested that there has been limited consultation of stakeholders in terms of the River Basin Planning process in Helgeår. In the Selka however, the pathways chosen by stakeholder did not deviate significantly from the business as usual which focusses on tackling water quality issues.

The business as usual pathways are essentially one dimensional. Namely the measures embodied in the pathway only pays lip service to a discrete sector. In contrast, the stakeholder defined pathways have embodied a diversity of perspectives, reflected in constellations of measures which provide benefits to a broader cross section of stakeholders than the business as usual pathways. This suggests that the reconfigured program of measures could have an improved capacity to address the manifest controversies and uncertainties in the case settings. More research is needed in order to establish if these reconfigurations have led to an overall improvement in addressing nutrient emissions both locally and a regional level.

To conclude the process of the reconciliation of stakeholder's, interests and position is an ongoing process with MIRACLE. The Systemic issues and the pathways have thus far served as mediating objects to support co-deliberation between stakeholders and project staff. The role scientific data provision plays as a mediating object to support co-enquiry and social learning, will be facilitated in MIRACLE's last two stakeholder learning events, the cross-case learning workshop, and the Baltic Sea Region governance learning events. The findings and data presented in this report, will be drawn upon to support the final phase of research in MIRACLE, and this will be summarised in deliverable 5.6, a scientific paper "Examining social learning as a governance innovation to reconcile multiple demands.

6. APPENDICES

Appendix 1: Berze Stakholder Interests in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.5403	0.2543	0.0371	0.0110		
1	M1	-0.5159	0.0418	-0.6395	0.2457	14.00	14.00
2	M2	-0.5021	-0.0111	-0.4536	0.0067	15.00	15.00
3	M3	-0.5021	-0.0111	-0.4536	0.0067	15.00	15.00
4	M4	1.5219	1.7628	-0.0214	-0.0418	12.00	12.00
5	M5	-0.5268	-0.0082	0.3597	-0.4205	16.00	16.00
6	M6	-0.5268	-0.0082	0.3597	-0.4205	16.00	16.00
7	M7	-0.4023	0.0427	0.6793	0.6164	17.00	17.00
8	M8	1.4588	-1.1511	-0.0127	-0.0085	19.00	19.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2	
	EIG	0.5403	0.2543	0.0371	0.0110			
1	MOEP.RP	0.0008	0.1630	-0.1181	-0.0189	8.00	8.00	
2	Env. Geo	0.0008	0.1630	-0.1181	-0.0189	8.00	8.00	
3	Nature P	-0.2270	-0.3791	0.4142	-0.3496	6.00	6.00	
4	Jelgava	1.1693	0.4327	1.1164	1.8018	3.00	3.00	
5	MOA	-0.2948	-0.3131	-0.1191	0.0355	7.00	7.00	
6	Real Pro	-0.6602	0.0174	2.4197	-0.7151	3.00	3.00	
7	Rural Su	-0.2948	-0.3131	-0.1191	0.0355	7.00	7.00	
8	MOE	1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00	
9	MOH	2.0704	3.4960	-0.1109	-0.3996	1.00	1.00	
10	Zemgale	2.0275	0.6066	-0.0883	-0.2402	2.00	2.00	
11	Mu-Auce	1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00	
12	Mu-Dobel	2.0275	0.6066	-0.0883	-0.2402	2.00	2.00	
13	Mu-Jelga	1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00	
14	Mu-Broce	2.0275	0.6066	-0.0883	-0.2402	2.00	2.00	
15	Mu-Saldu	1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00	
16	Mu-Tukum		1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00
17	Mu-Jaunp	2.0275	0.6066	-0.0883	-0.2402	2.00	2.00	
18	Rural Ad	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
19	Env Pro	0.0008	0.1630	-0.1181	-0.0189	8.00	8.00	
20	Fund 4 N	0.0008	0.1630	-0.1181	-0.0189	8.00	8.00	
21	Anglers	0.0008	0.1630	-0.1181	-0.0189	8.00	8.00	
22	Water Se	2.0704	3.4960	-0.1109	-0.3996	1.00	1.00	
23	Famers P	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
24	Organic	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
25	Agri Coo	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
26	Farmers	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
27	Farmers	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
28	Farmers	-0.6747	0.0152	-0.1280	0.0548	6.00	6.00	
29	Small Hy	1.9846	-2.2828	-0.0658	-0.0808	1.00	1.00	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.6361	0.2993	0.0437	0.0129	
1	M1	0.3390	0.1536	0.5163	0.2226	33.71	14.00
2	M2	0.3301	0.1778	0.3900	0.0994	27.50	15.00
3	M3	0.3301	0.1778	0.3900	0.0994	27.50	15.00
4	M4	1.0534	1.4697	0.3385	0.5638	96.21	12.00
5	M5	0.3317	0.1722	0.6852	0.4254	44.45	16.00
6	M6	0.3317	0.1722	0.6852	0.4254	44.45	16.00

7	M7	0.4803	0.1973	0.8509	0.7281	61.72	17.00
8	M8	1.0920	1.3216	0.2879	0.4379	89.64	19.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2	
	FR FITTED		0.6361	0.2993	0.0437	0.0129		
1	MOEP.RP	0.8611	0.7445	0.4486	0.3158	63.18	8.00	
2	Env. Geo	0.8611	0.7445	0.4486	0.3158	63.18	8.00	
3	Nature P	0.7307	0.4690	0.5423	0.4679	56.28	6.00	
4	Jelgava	0.9448	1.2151	0.9592	1.6413	122.30	3.00	
5	MOA	0.6896	0.4348	0.4784	0.3383	50.20	7.00	
6	Real Pro	0.1845	0.0255	1.9593	0.8055	106.33	3.00	
7	Rural Su	0.6896	0.4348	0.4784	0.3383	50.20	7.00	
8	MOE	0.5258	1.1317	0.0531	0.0723	62.56	1.00	
9	MOH	0.5485	1.7332	0.0895	0.3577	92.75	1.00	
10	Zemgale	0.5381	1.4876	0.0715	0.2157	79.91	2.00	
11	Mu-Auce	0.5258	1.1317	0.0531	0.0723	62.56	1.00	
12	Mu-Dobel	0.5381	1.4876	0.0715	0.2157	79.91	2.00	
13	Mu-Jelga	0.5258	1.1317	0.0531	0.0723	62.56	1.00	
14	Mu-Broce	0.5381	1.4876	0.0715	0.2157	79.91	2.00	
15	Mu-Saldu	0.5258	1.1317	0.0531	0.0723	62.56	1.00	
16	Mu-Tukum		0.5258	1.1317	0.0531	0.0723	62.56	1.00
17	Mu-Jaunp	0.5381	1.4876	0.0715	0.2157	79.91	2.00	
18	Rural Ad	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
19	Env Pro	0.8611	0.7445	0.4486	0.3158	63.18	8.00	
20	Fund 4 N	0.8611	0.7445	0.4486	0.3158	63.18	8.00	
21	Anglers	0.8611	0.7445	0.4486	0.3158	63.18	8.00	
22	Water Se	0.5485	1.7332	0.0895	0.3577	92.75	1.00	
23	Famers P	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
24	Organic	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
25	Agri Coo	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
26	Farmers	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
27	Farmers	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
28	Farmers	0.1839	0.0256	0.5166	0.3670	33.02	6.00	
29	Small Hy	0.5258	1.1317	0.0531	0.0723	62.56	1.00	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.6361	0.2993	0.0437	0.0129	
1	M1	0.6224	0.6253	0.8760	0.8961	0.31	0.00
2	M2	0.7827	0.7830	0.9504	0.9505	0.24	0.00
3	M3	0.7827	0.7830	0.9504	0.9505	0.24	0.00
4	M4	0.5207	0.9999	0.9999	1.0000	3.27	0.00
5	M5	0.8212	0.8214	0.9217	0.9962	0.25	0.00
6	M6	0.8212	0.8214	0.9217	0.9962	0.25	0.00
7	M7	0.4779	0.4816	0.8389	0.9987	0.25	0.00
8	M8	0.7007	1.0000	1.0000	1.0000	2.23	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.6361	0.2993	0.0437	0.0129	
1	MOEP.RP	0.0163	0.0029	0.0002	0.0002	0.02	98.86
2	Env. Geo	0.0163	0.0029	0.0002	0.0002	0.02	98.86
3	Nature P	0.2358	0.1634	0.1303	0.1175	0.27	57.07
4	Jelgava	0.6788	0.5844	0.3443	0.0043	1.68	99.74
5	MOA	0.0527	0.0032	0.0005	0.0004	0.12	99.69
6	Real Pro	1.2123	1.2121	0.0840	0.0304	1.53	98.01
7	Rural Su	0.0527	0.0032	0.0005	0.0004	0.12	99.69
8	MOE	2.6311	0.0035	0.0026	0.0020	5.53	99.96
9	MOH	6.1825	0.0196	0.0173	0.0005	9.33	99.99
10	Zemgale	0.1932	0.0077	0.0062	0.0001	3.21	100.00

11	Mu-Auce	2.6311	0.0035	0.0026	0.0020	5.53	99.96	
12	Mu-Dobel	0.1932	0.0077	0.0062	0.0001	3.21	100.00	
13	Mu-Jelga	2.6311	0.0035	0.0026	0.0020	5.53	99.96	
14	Mu-Broce	0.1932	0.0077	0.0062	0.0001	3.21	100.00	
15	Mu-Saldu	2.6311	0.0035	0.0026	0.0020	5.53	99.96	
16	Mu-Tukum		2.6311	0.0035	0.0026	0.0020	5.53	99.96
17	Mu-Jaunp	0.1932	0.0077	0.0062	0.0001	3.21	100.00	
18	Rural Ad	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
19	Env Pro	0.0163	0.0029	0.0002	0.0002	0.02	98.86	
20	Fund 4 N	0.0163	0.0029	0.0002	0.0002	0.02	98.86	
21	Anglers	0.0163	0.0029	0.0002	0.0002	0.02	98.86	
22	Water Se	6.1825	0.0196	0.0173	0.0005	9.33	99.99	
23	Famers P	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
24	Organic	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
25	Agri Coo	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
26	Farmers	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
27	Farmers	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
28	Farmers	0.0038	0.0037	0.0005	0.0002	0.34	99.94	
29	Small Hy	2.6311	0.0035	0.0026	0.0020	5.53	99.96	

Appendix 2: Berze Positionholder Agency in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.4475	0.2041	0.0305	0.0123		
1	M1	-0.5877	0.0270	0.3723	-0.3313	30.00	15.00
2	M2	-0.5877	0.0270	0.3723	-0.3313	30.00	15.00
3	M3	-0.1738	-0.1792	-0.7330	-0.2075	36.00	19.64
4	M4	1.6049	-1.0888	0.2630	0.0136	33.00	15.78
5	M5	-0.1658	-0.1348	-0.5330	0.1414	40.00	20.00
6	M6	-0.6473	-0.0223	0.2392	0.7757	32.00	14.63
7	M7	-0.6202	-0.0068	0.2711	-0.1393	30.00	14.52
8	M8	1.1900	1.6232	0.0312	0.0207	29.00	14.25

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2	
	EIG	0.4475	0.2041	0.0305	0.0123			
1	MOEP.RP	0.2348	0.1315	0.3376	0.1340	18.00	7.36	
2	Env. Geo	0.4196	0.1726	0.3308	-0.0214	10.00	7.14	
3	Nature P	-0.0173	0.3297	0.2511	-0.4203	12.00	7.20	
4	Jelgava	0.4196	0.1726	0.3308	-0.0214	10.00	7.14	
5	MOA	-0.6933	-0.1066	-0.0106	-0.1389	18.00	6.00	
6	Real Pro	-0.7047	-0.1152	-0.0419	1.6059	9.00	4.76	
7	Rural Su	-0.6933	-0.1066	-0.0106	-0.1389	12.00	6.00	
8	MOE	1.7789	3.5926	0.1789	0.1867	3.00	1.00	
9	MOH	2.3991	-2.4099	1.5070	0.1227	2.00	1.00	
10	Zemgale	2.1924	-0.4091	1.0643	0.1441	3.00	1.80	
11	Mu-Auce	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
12	Mu-Dobel	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
13	Mu-Jelga	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
14	Mu-Broce	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
15	Mu-Saldu	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
16	Mu-Tukum		1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57
17	Mu-Jaunp	1.2139	-0.3844	-0.8124	-0.0329	5.00	3.57	
18	Rural Ad	-0.6933	-0.1066	-0.0106	-0.1389	12.00	6.00	
19	Env Pro	0.0023	0.0679	0.2028	-0.0655	16.00	8.00	
20	Fund 4 N	-0.1575	0.2330	0.1158	-0.0780	15.00	7.76	
21	Anglers	-0.1575	0.2330	0.1158	-0.0780	15.00	7.76	
22	Water Se	2.3991	-2.4099	1.5070	0.1227	3.00	1.00	
23	Famers P	-0.6933	-0.1066	-0.0106	-0.1389	18.00	6.00	
24	Organic	-0.6701	-0.1274	-0.2787	0.2177	16.00	5.82	
25	Agri Coo	-0.6933	-0.1066	-0.0106	-0.1389	12.00	6.00	
26	Farmers	-0.6933	-0.1066	-0.0106	-0.1389	6.00	6.00	
27	Farmers	-0.6933	-0.1066	-0.0106	-0.1389	6.00	6.00	
28	Farmers	-0.6933	-0.1066	-0.0106	-0.1389	6.00	6.00	
29	Small Hy	1.7789	3.5926	0.1789	0.1867	3.00	1.00	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.6386	0.2913	0.0435	0.0175	
1	M1	0.4345	0.1588	0.3452	0.4454	36.45	15.00
2	M2	0.4345	0.1588	0.3452	0.4454	36.45	15.00
3	M3	0.7361	0.2230	0.7067	0.3517	55.11	19.64
4	M4	0.9726	1.0388	0.8756	0.1087	83.72	15.78
5	M5	0.7090	0.2183	0.5718	0.4081	51.09	20.00
6	M6	0.4358	0.1468	0.2548	0.8552	50.20	14.63
7	M7	0.4365	0.1485	0.2779	0.3517	32.15	14.52
8	M8	0.8550	1.7283	0.4915	0.1542	99.79	14.25

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2	
	FR FITTED		0.6386	0.2913	0.0435	0.0175		
1	MOEP.RP	0.9050	0.8021	0.4565	0.3365	66.78	7.36	
2	Env. Geo	0.9456	0.8787	0.4563	0.3014	70.09	7.14	
3	Nature P	0.7999	0.7446	0.4430	0.4826	63.70	7.20	
4	Jelgava	0.9456	0.8787	0.4563	0.3014	70.09	7.14	
5	MOA	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
6	Real Pro	0.3175	0.0960	0.4266	1.4980	79.63	4.76	
7	Rural Su	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
8	MOE	0.5889	1.9694	0.1477	0.1661	103.38	1.00	
9	MOH	0.7942	1.3211	1.2441	0.1091	99.19	1.00	
10	Zemgale	0.7517	1.2980	0.8854	0.1282	87.32	1.80	
11	Mu-Auce	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
12	Mu-Dobel	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
13	Mu-Jelga	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
14	Mu-Broce	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
15	Mu-Saldu	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
16	Mu-Tukum		0.9095	1.0126	0.7885	0.1167	78.87	3.57
17	Mu-Jaunp	0.9095	1.0126	0.7885	0.1167	78.87	3.57	
18	Rural Ad	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
19	Env Pro	0.8325	0.6961	0.4350	0.3412	60.89	8.00	
20	Fund 4 N	0.7477	0.6652	0.4212	0.3540	57.10	7.76	
21	Anglers	0.7477	0.6652	0.4212	0.3540	57.10	7.76	
22	Water Se	0.7942	1.3211	1.2441	0.1091	99.19	1.00	
23	Famers P	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
24	Organic	0.3100	0.1062	0.5135	0.4389	37.54	5.82	
25	Agri Coo	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
26	Farmers	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
27	Farmers	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
28	Farmers	0.3103	0.0990	0.4527	0.4070	34.52	6.00	
29	Small Hy	0.5889	1.9694	0.1477	0.1661	103.38	1.00	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.6386	0.2913	0.0435	0.0175	
1	M1	0.8523	0.8535	0.9427	0.9876	0.27	0.00
2	M2	0.8523	0.8535	0.9427	0.9876	0.27	0.00
3	M3	0.1416	0.2432	0.9004	0.9338	0.14	0.00
4	M4	0.7588	0.9947	1.0000	1.0000	2.27	0.00
5	M5	0.1987	0.2874	0.8229	0.8468	0.09	0.00
6	M6	0.7813	0.7820	0.8098	0.9956	0.36	0.00
7	M7	0.8900	0.8900	0.9344	0.9418	0.29	0.00
8	M8	0.4431	0.9999	1.0000	1.0000	2.14	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3

Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.6386	0.2913	0.0435	0.0175	
1	MOEP.RP	0.0552	0.0473	0.0275	0.0255	0.09	72.33
2	Env. Geo	0.0344	0.0210	0.0019	0.0018	0.15	98.79
3	Nature P	0.1324	0.0832	0.0722	0.0527	0.13	60.26
4	Jelgava	0.0344	0.0210	0.0019	0.0018	0.15	98.79
5	MOA	0.0076	0.0024	0.0024	0.0003	0.33	99.91
6	Real Pro	0.3017	0.2957	0.2954	0.0098	0.63	98.46
7	Rural Su	0.0076	0.0024	0.0024	0.0003	0.33	99.91
8	MOE	5.8486	0.0173	0.0117	0.0079	7.97	99.90
9	MOH	3.0283	0.4044	0.0080	0.0064	6.88	99.91
10	Zemgale	0.2824	0.2068	0.0091	0.0068	3.50	99.80
11	Mu-Auce	0.1824	0.1156	0.0004	0.0003	1.17	99.97
12	Mu-Dobel	0.1824	0.1156	0.0004	0.0003	1.17	99.97
13	Mu-Jelga	0.1824	0.1156	0.0004	0.0003	1.17	99.97
14	Mu-Broce	0.1824	0.1156	0.0004	0.0003	1.17	99.97
15	Mu-Saldu	0.1824	0.1156	0.0004	0.0003	1.17	99.97
16	Mu-Tukum	0.1824	0.1156	0.0004	0.0003	1.17	99.97
17	Mu-Jaunp	0.1824	0.1156	0.0004	0.0003	1.17	99.97
18	Rural Ad	0.0076	0.0024	0.0024	0.0003	0.33	99.91
19	Env Pro	0.0108	0.0087	0.0015	0.0011	0.01	90.08
20	Fund 4 N	0.0284	0.0039	0.0016	0.0009	0.05	98.05
21	Anglers	0.0284	0.0039	0.0016	0.0009	0.05	98.05
22	Water Se	3.0283	0.4044	0.0080	0.0064	6.88	99.91
23	Famers P	0.0076	0.0024	0.0024	0.0003	0.33	99.91
24	Organic	0.0432	0.0359	0.0223	0.0171	0.34	95.03
25	Agri Coo	0.0076	0.0024	0.0024	0.0003	0.33	99.91
26	Farmers	0.0076	0.0024	0.0024	0.0003	0.33	99.91
27	Farmers	0.0076	0.0024	0.0024	0.0003	0.33	99.91
28	Farmers	0.0076	0.0024	0.0024	0.0003	0.33	99.91
29	Small Hy	5.8486	0.0173	0.0117	0.0079	7.97	99.90

Appendix 3: Helge Stakholder Interests in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.2278	0.0985	0.0801	0.0609		
1	M1	-0.0304	-0.1730	0.5251	0.1303	25.00	25.00
2	M2	-1.2164	-0.5077	0.5020	0.1731	15.00	15.00
3	M3	-0.7407	0.0348	-0.4799	-0.0603	19.00	19.00
4	M4	0.0266	-0.2179	0.1697	-0.2357	24.00	24.00
5	M5	0.2942	0.0469	0.7608	-0.8074	18.00	18.00
6	M6	-0.9441	0.9044	-0.3301	0.5817	12.00	12.00
7	M7	0.1643	-1.1504	-1.8490	-1.1179	9.00	9.00
8	M8	-0.7849	-0.1226	-0.0396	0.0043	20.00	20.00
9	M9	-0.1076	-0.2162	0.1794	0.0613	26.00	26.00
10	M10	-0.1396	1.7646	-0.5607	-0.6248	9.00	9.00
11	M11	0.7005	0.8816	-0.2128	0.0964	15.00	15.00
12	M12	0.6050	-0.2916	-0.5074	1.2316	17.00	17.00
13	M13	0.9851	0.3155	0.2288	-0.0909	18.00	18.00
14	M14	1.4020	-0.5069	0.0130	0.1353	13.00	13.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.2278	0.0985	0.0801	0.0609		
1	Water Bo	0.2305	0.3111	-0.5714	-0.2169	13.00	13.00
2	Mun Osby	-0.5728	-0.5395	-0.3776	-0.0158	10.00	10.00
3	Mun .str	-0.8361	-0.2349	0.0085	0.9553	8.00	8.00
4	Mun Ljun	-1.2068	-0.6275	0.4855	0.2502	5.00	5.00
5	Mun .lmh	-0.9635	-0.1693	-0.0759	1.2281	7.00	7.00
6	Mun H.ss	-0.7757	0.4160	-0.2125	0.5679	9.00	9.00
7	Mun Kris	-0.7851	-0.6242	-1.0399	0.3232	8.00	8.00
8	Natursky	0.3962	0.0921	-0.8137	-0.1733	11.00	11.00

9	Fishery	0.6017	0.1412	-0.5566	-0.4722	11.00	11.00
10	Model fo	0.9403	-0.4645	-0.2718	-0.2688	9.00	9.00
11	Sveaskog	0.9502	-0.4749	0.6911	0.2457	7.00	7.00
12	S.dra sk	0.9502	-0.4749	0.6911	0.2457	7.00	7.00
13	Forest o	0.8973	-0.3992	1.1051	-0.5450	6.00	6.00
14	Toursism	1.2411	0.0050	0.1331	1.0560	6.00	6.00
15	Hydropow	1.0379	0.4692	0.3170	0.3979	5.00	5.00
16	Sawmill	1.2880	0.0041	0.1274	0.8554	6.00	6.00
17	LRF (ass	-0.6272	-0.9185	-0.1022	-0.9380	8.00	8.00
18	Swedish	0.4613	-0.2038	0.5651	0.2867	9.00	9.00
19	Water au	0.2210	0.6425	-0.0747	0.1424	12.00	12.00
20	County S	-0.3728	0.7852	0.2385	-0.2843	11.00	11.00
21	County K	-0.3728	0.7852	0.2385	-0.2843	11.00	11.00
22	County	-0.3728	0.7852	0.2385	-0.2843	11.00	11.00
23	UNESCO	0.5238	-0.4509	-0.9805	0.0108	9.00	9.00
24	Ministry	-0.6524	0.2232	0.4218	-0.0253	9.00	9.00
25	Board of	-0.9964	-0.6386	0.5045	0.0493	6.00	6.00
26	Land own	-0.0017	-0.7958	0.0036	-0.7324	10.00	10.00
27	Swedish	-0.1552	1.0255	0.0850	-0.3829	10.00	10.00
28	Ministry	-0.6350	-0.6323	1.2350	-0.4551	6.00	6.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3757	0.1624	0.1321	0.1005	
1	M1	0.7536	0.5608	0.6156	0.5577	62.70	25.00
2	M2	0.7519	0.6829	0.6115	0.5825	66.05	15.00
3	M3	0.6590	0.6034	0.5756	0.5168	59.09	19.00
4	M4	0.6820	0.5837	0.5974	0.4854	59.13	24.00
5	M5	0.6373	0.6124	0.7404	0.7061	67.60	18.00
6	M6	0.6209	0.8192	0.4592	0.6684	65.46	12.00
7	M7	0.5850	0.8905	1.3711	0.9182	98.21	9.00
8	M8	0.6554	0.6100	0.5452	0.5053	58.18	20.00
9	M9	0.7418	0.5820	0.5769	0.5211	61.10	26.00
10	M10	0.4310	1.2493	0.5533	0.5589	76.89	9.00
11	M11	0.7057	0.7533	0.4792	0.4427	61.05	15.00
12	M12	0.8236	0.4302	0.6381	1.0433	76.80	17.00
13	M13	0.7495	0.5788	0.5556	0.4654	59.63	18.00
14	M14	0.8302	0.5179	0.6121	0.5111	63.11	13.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3757	0.1624	0.1321	0.1005	
1	Water Bo	0.6809	0.7382	0.7435	0.5931	69.16	13.00
2	Mun Osby	0.6463	0.6091	0.7618	0.6219	66.26	10.00
3	Mun .str	0.7218	0.4280	0.3852	0.8412	62.46	8.00
4	Mun Ljun	0.7729	0.4656	0.5105	0.2063	52.85	5.00
5	Mun .lmh	0.7754	0.4356	0.4098	1.0181	70.63	7.00
6	Mun H.ss	0.6815	0.7450	0.4318	0.6519	63.85	9.00
7	Mun Kris	0.7215	0.6851	1.0052	0.6728	78.31	8.00
8	Natursky	0.6806	0.7281	0.8430	0.5592	71.00	11.00
9	Fishery	0.6515	0.7302	0.7812	0.6853	71.37	11.00
10	Model fo	0.6896	0.6139	0.7437	0.6549	67.72	9.00
11	Sveaskog	0.7259	0.4063	0.6183	0.5959	59.78	7.00
12	S.dra sk	0.7259	0.4063	0.6183	0.5959	59.78	7.00
13	Forest o	0.7365	0.3739	0.8314	0.5255	64.22	6.00
14	Toursism	0.8391	0.4647	0.3438	0.9093	68.28	6.00
15	Hydropow	0.6587	0.5330	0.4866	0.7198	60.68	5.00
16	Sawmill	0.8412	0.4648	0.3421	0.8009	64.85	6.00
17	LRF (ass	0.6035	0.7277	0.7790	0.8348	74.12	8.00
18	Swedish	0.8208	0.4359	0.5517	0.5459	60.54	9.00
19	Water au	0.7068	0.7712	0.4036	0.5112	61.62	12.00
20	County S	0.6866	0.8385	0.4464	0.4219	62.29	11.00
21	County K	0.6866	0.8385	0.4464	0.4219	62.29	11.00
22	County	0.6866	0.8385	0.4464	0.4219	62.29	11.00
23	UNESCO	0.7534	0.6086	0.9322	0.5643	72.90	9.00
24	Ministry	0.6912	0.4902	0.4998	0.3516	52.24	9.00
25	Board of	0.6985	0.4671	0.4972	0.1398	49.32	6.00
26	Land own	0.7555	0.6662	0.6979	0.6895	70.30	10.00

27	Swedish	0.6039	0.9416	0.4123	0.4712	64.10	10.00
28	Ministry	0.6198	0.4641	0.9256	0.4809	64.95	6.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.3757	0.1624	0.1321	0.1005	
1	M1	0.0025	0.0549	0.4901	0.5135	0.18	0.00
2	M2	0.7199	0.8024	0.8751	0.8826	0.98	0.00
3	M3	0.6268	0.6277	0.7837	0.7859	0.42	0.00
4	M4	0.0020	0.0919	0.1411	0.2239	0.17	0.00
5	M5	0.0742	0.0755	0.3699	0.6590	0.56	0.00
6	M6	0.3939	0.6315	0.6601	0.7374	1.08	0.00
7	M7	0.0073	0.2435	0.7938	0.9692	1.76	0.00
8	M8	0.7507	0.7628	0.7639	0.7639	0.39	0.00
9	M9	0.0377	0.1378	0.1999	0.2063	0.15	0.00
10	M10	0.0064	0.6817	0.7432	0.8097	1.45	0.00
11	M11	0.2908	0.5937	0.6096	0.6125	0.81	0.00
12	M12	0.2352	0.2712	0.3693	0.8734	0.74	0.00
13	M13	0.7978	0.8516	0.8771	0.8807	0.58	0.00
14	M14	0.7710	0.8372	0.8373	0.8410	1.22	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.3757	0.1624	0.1321	0.1005	
1	Water Bo	0.1702	0.1398	0.0473	0.0357	0.20	81.73
2	Mun Osby	0.2792	0.1878	0.1475	0.1474	0.44	66.18
3	Mun .str	0.2848	0.2675	0.2674	0.0422	0.62	93.18
4	Mun Ljun	0.6834	0.5598	0.4931	0.4776	1.38	65.35
5	Mun .lmh	0.4667	0.4577	0.4561	0.0838	0.91	90.79
6	Mun H.ss	0.3208	0.2665	0.2537	0.1741	0.61	71.36
7	Mun Kris	0.5909	0.4686	0.1625	0.1368	0.89	84.55
8	Natursky	0.3194	0.3167	0.1293	0.1219	0.39	69.08
9	Fishery	0.2325	0.2262	0.1385	0.0835	0.41	79.40
10	Model fo	0.1920	0.1243	0.1034	0.0856	0.61	86.06
11	Sveaskog	0.3665	0.2958	0.1606	0.1457	0.80	81.74
12	S.dra sk	0.3665	0.2958	0.1606	0.1457	0.80	81.74
13	Forest o	0.6701	0.6201	0.2744	0.2011	1.05	80.93
14	Toursism	0.5076	0.5076	0.5026	0.2273	1.24	81.71
15	Hydropow	1.1264	1.0573	1.0288	0.9898	1.64	39.67
16	Sawmill	0.4724	0.4724	0.4678	0.2872	1.26	77.29
17	LRF (ass	0.5226	0.2578	0.2549	0.0377	0.71	94.69
18	Swedish	0.4150	0.4020	0.3116	0.2913	0.52	43.61
19	Water au	0.1946	0.0650	0.0634	0.0584	0.22	73.18
20	County S	0.2460	0.0526	0.0365	0.0165	0.31	94.72
21	County K	0.2460	0.0526	0.0365	0.0165	0.31	94.72
22	County	0.2460	0.0526	0.0365	0.0165	0.31	94.72
23	UNESCO	0.5041	0.4403	0.1682	0.1682	0.64	73.52
24	Ministry	0.2634	0.2478	0.1974	0.1973	0.47	57.72
25	Board of	0.4557	0.3277	0.2556	0.2550	0.93	72.56
26	Land own	0.4126	0.2138	0.2138	0.0814	0.41	80.27
27	Swedish	0.4165	0.0864	0.0844	0.0482	0.43	88.73
28	Ministry	0.7565	0.6311	0.1994	0.1482	0.95	84.38

Appendix 4: Helge Positionholder Agency in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.2157	0.1161	0.1005	0.0774		
1	M1	0.6630	0.1370	0.0324	-0.5333	38.00	13.88

2	M2	-0.9382	-0.9204	1.7555	-2.0676	11.00	5.76
3	M3	0.7115	-0.0796	0.2083	-0.7838	23.00	12.30
4	M4	-0.0569	0.1706	0.0383	-0.4724	58.00	20.02
5	M5	-0.5381	1.5969	1.7876	0.5951	25.00	9.33
6	M6	1.9170	-0.9658	0.9404	0.9070	28.00	10.59
7	M7	-0.0775	0.6139	-0.4691	0.5686	50.00	22.32
8	M8	-0.1023	0.1797	-0.3015	-0.1343	45.00	20.45
9	M9	0.3700	0.7769	-0.5173	-0.2302	46.00	18.24
10	M10	1.0759	0.0303	-0.4888	-0.3688	25.00	9.33
11	M11	-0.3810	-0.4242	-0.1453	0.4541	66.00	23.17
12	M12	-0.2148	-0.2214	-0.2802	-0.0443	59.00	21.89
13	M13	-1.3155	-0.6046	0.0211	0.1305	33.00	13.44
14	M14	-0.3857	-0.5222	-0.0020	0.2400	58.00	20.51

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.2157	0.1161	0.1005	0.0774		
1	Water Bo	0.1365	1.5367	-1.3544	0.2445	3.00	3.00
2	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
3	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
4	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
5	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
6	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
7	Municipa	0.6910	-0.0961	-0.2912	-0.0317	31.00	10.80
8	Natursky	0.3977	0.6614	-0.5810	-0.8366	7.00	7.00
9	Fishery	0.0558	1.1442	-1.3321	0.3523	3.00	3.00
10	Model fo	-0.6845	1.2882	0.9782	0.6928	12.00	6.00
11	Sveaskog	-1.0261	-0.7651	-0.5172	0.8010	15.00	5.49
12	S.dra sk	-1.0261	-0.7651	-0.5172	0.8010	15.00	5.49
13	Forest o	-0.8417	0.0207	0.0901	0.4652	22.00	7.81
14	Tourism	-0.3368	2.8437	0.8679	1.5965	6.00	2.57
15	Hydropow	-0.9050	0.2380	1.0661	1.7584	4.00	1.60
16	Sawmill	-0.8244	-1.3603	-0.2775	1.3240	5.00	1.92
17	LRF (ass	-0.0746	0.4814	-0.7086	-0.0576	14.00	6.13
18	Swedish	-0.6883	-0.4764	-0.4792	0.4756	16.00	7.11
19	Water au	-0.1579	-0.0601	-0.7081	-0.1734	14.00	7.54
20	County a	-0.0290	0.2937	0.3397	-0.2861	31.00	12.16
21	County a	-0.0290	0.2937	0.3397	-0.2861	31.00	12.16
22	County a	0.1643	0.4363	0.3585	-0.3382	29.00	11.21
23	UNESCO h	-0.2017	0.7654	-0.7356	-0.3913	10.00	4.55
24	Ministry	-0.0442	-0.0622	0.9995	-0.4998	29.00	11.85
25	Board of	-0.9354	-0.6567	0.2064	-0.6717	19.00	8.02
26	Land own	-0.6267	0.3500	-0.1690	0.3768	26.00	8.89
27	Forest a	-0.5355	-0.1719	-0.4777	0.0975	18.00	8.10
28	Swedish	0.0451	0.0615	0.8246	-0.1143	27.00	11.22
29	Ministry	-0.9950	-1.0322	0.6154	-0.9872	20.00	7.14
30	The Swed	4.1276	-2.8351	2.9669	3.2592	3.00	1.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3025	0.1628	0.1409	0.1086	
1	M1	0.5339	0.2531	0.4988	0.4414	44.52	13.88
2	M2	0.7035	0.8203	1.2310	1.5216	111.79	5.76
3	M3	0.5812	0.2982	0.5640	0.6268	53.33	12.30
4	M4	0.5898	0.4770	0.5143	0.5105	52.45	20.02
5	M5	0.4590	1.3097	1.2798	0.7974	102.46	9.33
6	M6	1.5476	1.0853	1.2059	1.2378	128.06	10.59
7	M7	0.6384	0.9381	0.6367	0.6742	73.27	22.32
8	M8	0.5733	0.4332	0.5337	0.3775	48.57	20.45
9	M9	0.5196	0.7664	0.6330	0.4044	59.62	18.24
10	M10	0.6553	0.1900	0.4442	0.2906	43.22	9.33
11	M11	0.6777	0.5607	0.5211	0.6923	61.74	23.17
12	M12	0.6568	0.4922	0.5302	0.4519	53.83	21.89
13	M13	0.8047	0.6817	0.5377	0.5892	66.12	13.44
14	M14	0.7080	0.6175	0.4860	0.5449	59.49	20.51

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3025	0.1628	0.1409	0.1086	
1	Water Bo	0.2290	1.0441	0.9297	0.3974	73.57	3.00
2	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
3	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
4	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
5	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
6	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
7	Municipa	0.7903	0.4938	0.4533	0.4952	57.43	10.80
8	Natursky	0.4187	0.5466	0.4733	0.7261	55.35	7.00
9	Fishery	0.2515	0.8720	0.9156	0.4256	67.88	3.00
10	Model fo	0.5399	1.1681	1.1023	0.6388	90.54	6.00
11	Sveaskog	0.7004	0.6422	0.3916	0.6208	60.03	5.49
12	S.dra sk	0.7004	0.6422	0.3916	0.6208	60.03	5.49
13	Forest o	0.6012	0.6268	0.5829	0.4785	57.51	7.81
14	Tourism	0.3611	1.9277	1.2229	1.1911	130.01	2.57
15	Hydropow	0.4894	0.8891	1.1094	1.2705	98.43	1.60
16	Sawmill	0.4416	0.8982	0.2021	0.9613	70.12	1.92
17	LRF (ass	0.2980	0.5178	0.5263	0.4126	44.84	6.13
18	Swedish	0.5836	0.5130	0.3700	0.4759	49.17	7.11
19	Water au	0.6713	0.4549	0.5331	0.3892	52.28	7.54
20	County a	0.6805	0.6882	0.7402	0.5958	67.82	12.16
21	County a	0.6805	0.6882	0.7402	0.5958	67.82	12.16
22	County a	0.6144	0.7158	0.7665	0.6247	68.33	11.21
23	UNESCO h	0.4839	0.6870	0.5586	0.4552	55.35	4.55
24	Ministry	0.7720	0.7062	1.0023	0.8067	82.91	11.85
25	Board of	0.6935	0.6412	0.6213	0.8606	71.04	8.02
26	Land own	0.5543	0.6749	0.5786	0.4405	56.82	8.89
27	Forest a	0.5414	0.4537	0.3800	0.3643	44.05	8.10
28	Swedish	0.7281	0.7050	0.9056	0.6416	75.15	11.22
29	Ministry	0.7343	0.7875	0.7933	1.0937	86.38	7.14
30	The Swed	2.2106	1.8693	2.0265	2.3522	212.25	1.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.3025	0.1628	0.1409	0.1086	
1	M1	0.4639	0.4785	0.4792	0.6591	0.44	0.00
2	M2	0.1215	0.2073	0.4977	0.8514	3.36	0.00
3	M3	0.3337	0.3368	0.3563	0.5989	0.70	0.00
4	M4	0.0057	0.0429	0.0447	0.2783	0.27	0.00
5	M5	0.0612	0.4565	0.9175	0.9623	2.20	0.00
6	M6	0.6333	0.7512	0.8553	0.9402	2.69	0.00
7	M7	0.0055	0.2610	0.3998	0.5788	0.50	0.00
8	M8	0.0200	0.0652	0.1836	0.2043	0.24	0.00
9	M9	0.1225	0.5185	0.6819	0.7103	0.52	0.00
10	M10	0.5391	0.5394	0.6154	0.6533	1.00	0.00
11	M11	0.1342	0.2562	0.2695	0.3838	0.50	0.00
12	M12	0.1179	0.2098	0.3468	0.3498	0.18	0.00
13	M13	0.6661	0.7693	0.7694	0.7733	1.21	0.00
14	M14	0.2162	0.5070	0.5070	0.5572	0.32	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.3025	0.1628	0.1409	0.1086	
1	Water Bo	3.0067	2.2022	1.6208	1.6041	3.02	46.80
2	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20
3	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20
4	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20
5	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20
6	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20

7	Municipa	0.0458	0.0427	0.0158	0.0155	0.27	94.20
8	Natursky	0.8630	0.7140	0.6070	0.4123	0.94	55.98
9	Fishery	2.6829	2.2368	1.6744	1.6399	2.68	38.91
10	Model fo	1.3207	0.7554	0.4520	0.3185	1.54	79.30
11	Sveaskog	0.5677	0.3682	0.2834	0.1049	1.06	90.08
12	S.dra sk	0.5677	0.3682	0.2834	0.1049	1.06	90.08
13	Forest o	0.2025	0.2024	0.1998	0.1396	0.53	73.74
14	Tourism	4.6246	1.8698	1.6311	0.9217	4.68	80.29
15	Hydropow	4.8475	4.8282	4.4679	3.6075	5.23	30.99
16	Sawmill	3.3248	2.6944	2.6700	2.1821	3.64	40.06
17	LRF (ass	0.7000	0.6211	0.4619	0.4610	0.70	34.39
18	Swedish	0.3095	0.2321	0.1594	0.0964	0.53	81.79
19	Water au	0.6411	0.6399	0.4810	0.4726	0.65	27.60
20	County a	0.1619	0.1325	0.0959	0.0731	0.16	54.94
21	County a	0.1619	0.1325	0.0959	0.0731	0.16	54.94
22	County a	0.2341	0.1693	0.1285	0.0967	0.25	60.80
23	UNESCO h	1.4586	1.2591	1.0875	1.0449	1.48	29.28
24	Ministry	0.4672	0.4659	0.1492	0.0797	0.47	82.98
25	Board of	0.4807	0.3338	0.3203	0.1947	0.89	78.05
26	Land own	0.1613	0.1195	0.1105	0.0710	0.34	79.35
27	Forest a	0.2216	0.2115	0.1392	0.1365	0.35	61.52
28	Swedish	0.3011	0.2998	0.0842	0.0806	0.30	73.31
29	Ministry	1.0172	0.6542	0.5342	0.2630	1.48	82.19
30	The Swed	11.2661	8.5278	5.7378	2.7817	19.18	85.50

Appendix 5: Reda Stakeholder Interests in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.1397	0.1027	0.0642	0.0394		
1	M1	-0.2545	-0.4914	0.0766	-0.2819	17.00	17.00
2	M2	-0.2545	-0.4914	0.0766	-0.2819	17.00	17.00
3	M3	-0.4570	-0.4440	0.0672	-0.2573	18.00	18.00
4	M4	-0.5555	-0.0684	0.5951	0.7847	19.00	19.00
5	M5	-0.8845	-0.1269	-0.1139	-0.1750	16.00	16.00
6	M6	0.2973	-0.3715	-0.4173	0.2658	15.00	15.00
7	M7	-0.5363	-0.1874	-0.0526	0.0326	18.00	18.00
8	M8	-0.8704	0.3272	-0.1578	-0.9715	14.00	14.00
9	M9	-0.3794	-0.2160	0.6238	0.6668	20.00	20.00
10	M10	-0.2766	0.7168	-0.3523	-0.1906	18.00	18.00
11	M11	-0.3985	0.2966	-0.6567	0.1612	15.00	15.00
12	M12	0.6782	0.0062	-0.6012	0.4041	15.00	15.00
13	M13	0.7531	0.5323	-0.5818	-0.0340	15.00	15.00
14	M14	0.5608	0.8990	1.0072	0.0874	20.00	20.00
15	M15	0.6373	0.8413	0.4519	-0.5926	19.00	19.00
16	M16	0.7246	0.1091	-0.7051	0.5799	14.00	14.00
17	M17	1.7282	-2.1453	0.9282	-0.9233	4.00	4.00
18	M18	0.4496	-0.3664	-0.1743	0.1473	14.00	14.00
19	M19	2.9625	-2.9809	1.5159	-0.9157	1.00	2.00
20	M20	0.5818	-0.6831	-0.3698	-0.2548	11.00	11.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.1397	0.1027	0.0642	0.0394		
1	Reg Au P	-1.1115	-0.2997	-0.1117	-0.1131	11.00	11.00
2	County W	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
3	Mu 1	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
4	Mu 2	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
5	Mu 3	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
6	Mu 4	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
7	Mu 5	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
8	River As	-0.0274	0.0489	-0.2816	0.0253	18.00	18.00
9	Fish Org	0.4303	2.0697	0.2897	-1.7134	5.00	5.00
10	Forest O	0.5724	0.5375	-0.0742	0.9849	11.00	11.00
11	Land . W	0.0174	0.1244	-0.1867	0.4144	16.00	16.00
12	Water Mg	-0.6807	0.2066	0.6181	-0.0213	11.00	11.00
13	Env Pro	0.3588	-0.3797	-0.0435	0.0388	18.00	18.00

14	Inst Met	1.0239	1.5161	-0.8109	0.2988	7.00	7.00
15	Agri Org	1.1090	-0.9682	0.2959	-0.3124	14.50	14.75
16	Env Pro	-0.2033	0.2596	-0.1826	0.0622	16.00	16.00
17	Fish Ind	1.6027	2.7151	2.8791	-1.2720	2.00	2.00
18	Farmers	1.1055	-0.9425	0.4722	-0.0513	14.50	14.75
19	Tourism	-0.6289	0.1020	0.6734	-0.4330	12.00	12.00
20	Housing	-1.4575	0.1162	-0.0233	0.0321	8.00	8.00
21	Hydropow	-0.3336	0.6392	2.9285	2.5831	3.00	3.00
22	Water tr	-1.4020	-0.6624	0.5501	-0.3043	8.00	8.00
23	Public	0.0104	-0.4597	0.2161	-0.4084	17.00	17.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3058	0.2248	0.1405	0.0863	
1	M1	0.6401	0.5051	0.3583	0.3026	47.03	17.00
2	M2	0.6401	0.5051	0.3583	0.3026	47.03	17.00
3	M3	0.7364	0.4802	0.3475	0.2849	49.37	18.00
4	M4	0.7072	0.3747	0.8568	0.8985	73.86	19.00
5	M5	0.7714	0.2673	0.3469	0.2421	45.97	16.00
6	M6	0.5493	0.4763	0.3906	0.3715	45.25	15.00
7	M7	0.7159	0.3729	0.3284	0.3093	46.23	18.00
8	M8	0.7852	0.6364	0.3444	0.9012	69.86	14.00
9	M9	0.7063	0.4421	0.8530	0.8290	72.62	20.00
10	M10	0.5918	0.7747	0.4327	0.5238	59.41	18.00
11	M11	0.6137	0.4742	0.5724	0.2140	49.37	15.00
12	M12	0.6189	0.5697	0.5367	0.4460	54.65	15.00
13	M13	0.6500	0.8353	0.5284	0.5346	64.91	15.00
14	M14	0.6825	1.0674	1.2132	0.8067	96.54	20.00
15	M15	0.7095	1.0614	0.8198	0.7353	84.30	19.00
16	M16	0.6470	0.5805	0.5995	0.5463	59.44	14.00
17	M17	1.1829	1.4824	0.7175	0.7622	108.31	4.00
18	M18	0.5361	0.4772	0.3399	0.3571	43.54	14.00
19	M19	1.8552	2.0256	1.1352	0.7454	153.21	2.00
20	M20	0.5662	0.6061	0.3880	0.2529	47.50	11.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.3058	0.2248	0.1405	0.0863	
1	Reg Au P	0.7612	0.4247	0.3811	0.4747	53.16	11.00
2	County W	0.5656	0.4748	0.5173	0.4312	49.97	18.00
3	Mu 1	0.5656	0.4748	0.5173	0.4312	49.97	18.00
4	Mu 2	0.5656	0.4748	0.5173	0.4312	49.97	18.00
5	Mu 3	0.5656	0.4748	0.5173	0.4312	49.97	18.00
6	Mu 4	0.5656	0.4748	0.5173	0.4312	49.97	18.00
7	Mu 5	0.5656	0.4748	0.5173	0.4312	49.97	18.00
8	River As	0.5656	0.4748	0.5173	0.4312	49.97	18.00
9	Fish Org	0.6864	1.4220	0.6186	1.4275	110.83	5.00
10	Forest O	0.6245	0.5897	0.5657	0.8781	67.62	11.00
11	Land . W	0.5397	0.4715	0.5139	0.4992	50.67	16.00
12	Water Mg	0.6108	0.5282	0.6482	0.3979	55.47	11.00
13	Env Pro	0.6900	0.7253	0.5252	0.4259	60.40	18.00
14	Inst Met	0.7893	1.0817	0.8653	0.4307	82.57	7.00
15	Agri Org	1.0356	1.0903	0.6326	0.5128	85.50	14.75
16	Env Pro	0.5800	0.4891	0.5129	0.4535	51.10	16.00
17	Fish Ind	1.0044	1.8452	2.1675	1.0746	160.20	2.00
18	Farmers	1.0353	1.0812	0.7008	0.4981	86.32	14.75
19	Tourism	0.6335	0.5082	0.6362	0.5798	59.17	12.00
20	Housing	0.9364	0.3618	0.4102	0.5207	60.15	8.00
21	Hydropow	0.5327	0.6582	2.1945	2.0924	157.41	3.00
22	Water tr	0.9075	0.5184	0.4993	0.5818	64.81	8.00
23	Public	0.6708	0.7530	0.5162	0.5721	63.46	17.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.3058	0.2248	0.1405	0.0863	
1	M1	0.1208	0.5071	0.5146	0.5933	0.20	0.00
2	M2	0.1208	0.5071	0.5146	0.5933	0.20	0.00
3	M3	0.4187	0.7576	0.7637	0.8342	0.19	0.00
4	M4	0.3203	0.3245	0.5737	0.9133	0.36	0.00
5	M5	0.8601	0.8753	0.8849	0.9028	0.34	0.00
6	M6	0.1251	0.2927	0.4598	0.5129	0.26	0.00
7	M7	0.5199	0.5743	0.5777	0.5787	0.21	0.00
8	M8	0.3845	0.4311	0.4396	0.6942	0.74	0.00
9	M9	0.1927	0.2462	0.5993	0.9156	0.28	0.00
10	M10	0.0830	0.5608	0.6521	0.6730	0.34	0.00
11	M11	0.1358	0.2003	0.4502	0.4620	0.44	0.00
12	M12	0.5158	0.5158	0.7906	0.8879	0.33	0.00
13	M13	0.4065	0.5806	0.7451	0.7455	0.52	0.00
14	M14	0.1793	0.5743	0.9663	0.9686	0.66	0.00
15	M15	0.2723	0.6792	0.7720	0.8971	0.56	0.00
16	M16	0.4455	0.4542	0.7401	0.8917	0.44	0.00
17	M17	0.2992	0.6946	0.7531	0.7984	3.73	0.00
18	M18	0.2198	0.3449	0.3673	0.3799	0.34	0.00
19	M19	0.3510	0.6558	0.7181	0.7359	9.34	0.00
20	M20	0.2145	0.4680	0.5268	0.5487	0.59	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.3058	0.2248	0.1405	0.0863	
1	Reg Au P	0.1602	0.1315	0.1283	0.1258	0.62	79.78
2	County W	0.0404	0.0396	0.0195	0.0194	0.04	52.28
3	Mu 1	0.0404	0.0396	0.0195	0.0194	0.04	52.28
4	Mu 2	0.0404	0.0396	0.0195	0.0194	0.04	52.28
5	Mu 3	0.0404	0.0396	0.0195	0.0194	0.04	52.28
6	Mu 4	0.0404	0.0396	0.0195	0.0194	0.04	52.28
7	Mu 5	0.0404	0.0396	0.0195	0.0194	0.04	52.28
8	River As	0.0404	0.0396	0.0195	0.0194	0.04	52.28
9	Fish Org	2.4862	1.1132	1.0920	0.5090	2.56	80.08
10	Forest O	0.5120	0.4194	0.4180	0.2254	0.63	64.47
11	Land . W	0.1268	0.1218	0.1130	0.0789	0.13	37.83
12	Water Mg	0.3609	0.3472	0.2504	0.2503	0.53	53.13
13	Env Pro	0.1579	0.1117	0.1112	0.1109	0.21	46.17
14	Inst Met	1.2384	0.5017	0.3351	0.3174	1.63	80.53
15	Agri Org	0.4168	0.1164	0.0942	0.0749	0.88	91.46
16	Env Pro	0.1114	0.0898	0.0814	0.0806	0.13	36.47
17	Fish Ind	5.7373	3.3747	1.2743	0.9530	6.70	85.77
18	Farmers	0.4156	0.1309	0.0744	0.0739	0.87	91.53
19	Tourism	0.2999	0.2966	0.1817	0.1445	0.45	67.74
20	Housing	0.4086	0.4043	0.4042	0.4040	1.20	66.41
21	Hydropow	4.0461	3.9152	1.7422	0.4171	4.09	89.80
22	Water tr	0.4465	0.3059	0.2292	0.2108	1.18	82.15
23	Public	0.2828	0.2151	0.2033	0.1702	0.28	39.85

Appendix 6: Reda Positionholder Agency in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.1405	0.1175	0.0721	0.0351		
1	M1	-0.2299	-0.4616	0.0196	-0.2468	48.00	16.70
2	M2	-0.2617	-0.4436	0.0668	-0.2630	49.00	16.79
3	M3	-0.5078	-0.4155	0.1287	-0.2251	52.00	17.79
4	M4	-0.5872	0.1698	0.6062	0.9198	55.00	18.79
5	M5	-0.8584	0.0713	-0.0387	-0.2653	46.00	15.79
6	M6	0.2385	-0.3931	-0.4679	0.3466	43.00	14.79
7	M7	-0.6030	-0.1031	0.0491	0.0803	52.00	17.79
8	M8	-0.8089	0.2288	-0.1108	-0.6034	40.00	13.79
9	M9	-0.3966	-0.2335	0.5501	0.5026	55.00	19.52

10	M10	-0.1024	0.7114	-0.2393	-0.4364	52.00	17.79
11	M11	-0.3907	0.3599	-0.4862	-0.3621	43.00	14.79
12	M12	0.4968	0.1555	-0.7556	0.3345	42.00	14.46
13	M13	0.7862	0.4283	-0.5991	0.0601	44.00	14.89
14	M14	0.8248	0.7219	1.1520	0.0043	56.00	19.12
15	M15	0.8596	0.7640	0.3717	-0.5302	49.00	17.79
16	M16	0.7162	0.1074	-0.7035	0.6411	39.00	13.70
17	M17	1.4529	-2.6373	0.9028	-1.0087	11.00	3.90
18	M18	0.2716	-0.3625	-0.3377	0.3417	39.00	13.70
19	M19	2.5267	-3.8935	1.3868	-0.1975	3.07	2.00
20	M20	0.4186	-0.8107	-0.4872	-0.1203	32.00	10.89

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2	
	EIG	0.1405	0.1175	0.0721	0.0351			
1	Marshal	-1.0933	-0.1350	0.0263	-0.2683	33.00	11.00	
2	Wejherow	-0.0199	0.0802	-0.2652	0.0529	54.00	18.00	
3	Mu-Reda	-0.0199	0.0802	-0.2652	0.0529	54.00	18.00	
4	Mu-Wejhe	-0.0199	0.0802	-0.2652	0.0529	54.00	18.00	
5	Mu-Rumia	-0.0199	0.0802	-0.2652	0.0529	54.00	18.00	
6	Mu-Leczy	-0.1759	-0.0356	-0.4839	-0.0095	49.00	17.27	
7	Mu-Szemu	-0.1759	-0.0356	-0.4839	-0.0095	49.00	17.27	
8	River Va	0.1083	0.1010	-0.2557	0.2596	48.00	17.45	
9	Fishing	0.9495	1.6986	0.4190	-1.3895	13.00	4.83	
10	Forestry	0.6574	0.6110	-0.1603	1.0246	31.00	10.80	
11	RB Land	0.0534	0.2069	-0.0888	0.3159	46.00	15.79	
12	RO Water	-0.5464	0.3026	0.7380	-0.3989	33.00	11.00	
13	RD Env P	0.2675	-0.2038	-0.0927	0.0385	51.00	17.69	
14	Inst. Me	1.2159	1.3536	-0.6703	-0.2202	21.00	7.00	
15	Agr Adv	0.8594	-1.4681	0.3427	-0.1237	37.54	14.04	
16	WFOSiGW		-0.1062	0.3169	-0.1125	-0.0238	47.00	15.89
18	Fish Ind	2.2468	2.1671	2.8371	-1.4040	6.00	2.00	
19	Farmers	1.0348	-1.2015	0.4022	0.0497	40.54	14.24	
20	Tourist	-0.6699	0.1435	0.6260	-0.1955	31.00	11.31	
21	Housing	-1.4374	0.1892	0.2924	-0.0313	22.00	7.81	
22	Hydropow	-0.0268	0.8051	2.9674	2.5211	8.00	2.91	
23	Water tr	-1.4495	-0.3789	0.6677	0.1201	21.00	7.74	
24	Public	-0.0757	-0.5097	0.2059	-0.6444	47.00	16.61	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.2881	0.2410	0.1479	0.0719	
1	M1	0.5797	0.5793	0.3751	0.3028	47.54	16.70
2	M2	0.5853	0.5704	0.3843	0.3107	47.76	16.79
3	M3	0.7226	0.5541	0.3884	0.2855	51.52	17.79
4	M4	0.7008	0.3947	0.8862	0.9867	77.56	18.79
5	M5	0.7402	0.2235	0.3784	0.3157	45.84	15.79
6	M6	0.5152	0.5947	0.4282	0.4292	49.67	14.79
7	M7	0.7205	0.4384	0.3806	0.3410	49.30	17.79
8	M8	0.7746	0.4540	0.3832	0.6089	57.53	13.79
9	M9	0.6978	0.5417	0.7676	0.6897	67.92	19.52
10	M10	0.6048	0.6995	0.4139	0.5853	58.50	17.79
11	M11	0.6333	0.4595	0.4949	0.3732	49.91	14.79
12	M12	0.5204	0.5802	0.6091	0.4379	54.09	14.46
13	M13	0.6812	0.7851	0.5333	0.4711	62.98	14.89
14	M14	0.8574	0.9734	1.2837	0.8074	99.78	19.12
15	M15	0.8745	0.9415	0.8310	0.6939	84.01	17.79
16	M16	0.6375	0.6418	0.5805	0.5970	61.48	13.70
17	M17	1.0181	1.8017	0.6831	0.8688	117.30	3.90
18	M18	0.4552	0.5535	0.4109	0.4073	46.05	13.70
19	M19	1.5820	2.5621	1.0149	0.1824	159.14	2.00
20	M20	0.4749	0.7580	0.4658	0.2390	51.82	10.89

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation

Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2	
	FR FITTED		0.2881	0.2410	0.1479	0.0719		
1	Marshal	0.7476	0.3798	0.3335	0.4915	51.38	11.00	
2	Wejherow	0.5727	0.4517	0.5295	0.4172	49.66	18.00	
3	Mu-Reda	0.5727	0.4517	0.5295	0.4172	49.66	18.00	
4	Mu-Wejhe	0.5727	0.4517	0.5295	0.4172	49.66	18.00	
5	Mu-Rumia	0.5727	0.4517	0.5295	0.4172	49.66	18.00	
6	Mu-Leczy	0.5591	0.4342	0.5553	0.4131	49.50	17.27	
7	Mu-Szemu	0.5591	0.4342	0.5553	0.4131	49.50	17.27	
8	River Va	0.5875	0.4528	0.5500	0.4733	51.88	17.45	
9	Fishing	0.8614	1.1332	0.7118	1.1626	98.55	4.83	
10	Forestry	0.6847	0.5703	0.6172	0.9334	71.52	10.80	
11	RB Land	0.5718	0.4452	0.5181	0.4843	50.70	15.79	
12	RO Water	0.6315	0.4990	0.6894	0.5269	59.17	11.00	
13	RD Env P	0.6315	0.6954	0.5413	0.4488	58.67	17.69	
14	Inst. Me	0.8905	0.9251	0.8141	0.4378	79.11	7.00	
15	Agr Adv	0.9257	1.4306	0.6727	0.4245	94.02	14.04	
16	WFOSiGW		0.5966	0.4617	0.5178	0.4356	50.67	15.89
18	Fish Ind	1.4047	1.4243	2.1116	1.1719	156.80	2.00	
19	Farmers	0.9698	1.3261	0.6915	0.4743	92.23	14.24	
20	Tourist	0.6709	0.4407	0.6237	0.4663	55.92	11.31	
21	Housing	0.9231	0.3417	0.4151	0.4859	58.68	7.81	
22	Hydropow	0.6511	0.6509	2.1880	2.0870	158.04	2.91	
23	Water tr	0.9282	0.3609	0.5542	0.4952	62.13	7.74	
24	Public	0.6441	0.8522	0.5330	0.6835	68.78	16.61	

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.2881	0.2410	0.1479	0.0719	
1	M1	0.1098	0.5148	0.5154	0.5786	0.18	0.00
2	M2	0.1352	0.4907	0.4970	0.5653	0.19	0.00
3	M3	0.4620	0.7449	0.7661	0.8115	0.21	0.00
4	M4	0.3067	0.3302	0.5644	0.9406	0.42	0.00
5	M5	0.8398	0.8451	0.8464	0.8865	0.33	0.00
6	M6	0.0759	0.2644	0.4736	0.5536	0.28	0.00
7	M7	0.5454	0.5600	0.5626	0.5674	0.25	0.00
8	M8	0.3836	0.4117	0.4169	0.5235	0.64	0.00
9	M9	0.2568	0.3382	0.6921	0.8982	0.23	0.00
10	M10	0.0112	0.5038	0.5475	0.6487	0.35	0.00
11	M11	0.1281	0.2275	0.3696	0.4245	0.45	0.00
12	M12	0.2554	0.2783	0.7016	0.7594	0.36	0.00
13	M13	0.4230	0.5378	0.7137	0.7150	0.55	0.00
14	M14	0.3113	0.5294	0.9644	0.9644	0.82	0.00
15	M15	0.4071	0.7012	0.7557	0.8330	0.68	0.00
16	M16	0.4099	0.4183	0.7016	0.8658	0.47	0.00
17	M17	0.1911	0.7670	0.8199	0.8659	4.14	0.00
18	M18	0.0776	0.2041	0.2900	0.3514	0.36	0.00
19	M19	0.2416	0.7664	0.8185	0.8193	9.90	0.00
20	M20	0.1057	0.4683	0.5708	0.5752	0.62	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.2881	0.2410	0.1479	0.0719	
1	Marshal	0.1576	0.1513	0.1512	0.1377	0.61	77.27
2	Wejherow	0.0385	0.0363	0.0174	0.0169	0.04	56.27
3	Mu-Reda	0.0385	0.0363	0.0174	0.0169	0.04	56.27
4	Mu-Wejhe	0.0385	0.0363	0.0174	0.0169	0.04	56.27
5	Mu-Rumia	0.0385	0.0363	0.0174	0.0169	0.04	56.27
6	Mu-Leczy	0.0856	0.0851	0.0222	0.0222	0.10	77.12
7	Mu-Szemu	0.0856	0.0851	0.0222	0.0222	0.10	77.12
8	River Va	0.0801	0.0766	0.0591	0.0465	0.08	45.05
9	Fishing	2.2835	1.2943	1.2472	0.8856	2.62	66.22
10	Forestry	0.5084	0.3804	0.3735	0.1769	0.67	73.61
11	RB Land	0.1335	0.1188	0.1167	0.0980	0.13	27.17

12	RO Water	0.4235	0.3921	0.2459	0.2161	0.54	59.65	
13	RD Env P	0.1005	0.0862	0.0839	0.0836	0.13	34.29	
14	Inst. Me	1.0989	0.4708	0.3501	0.3410	1.65	79.37	
15	Agr Adv	0.8532	0.1143	0.0827	0.0799	1.13	92.93	
16	WFOSiGW		0.1328	0.0984	0.0950	0.0949	0.14	30.76
18	Fish Ind	5.2398	3.6297	1.4683	1.0991	7.13	84.59	
19	Farmers	0.6121	0.1171	0.0737	0.0733	1.01	92.77	
20	Tourist	0.3877	0.3807	0.2755	0.2683	0.56	51.74	
21	Housing	0.4303	0.4180	0.3951	0.3949	1.20	67.22	
22	Hydropow	4.2739	4.0516	1.6871	0.4967	4.27	88.38	
23	Water tr	0.4298	0.3806	0.2609	0.2582	1.22	78.79	
24	Public	0.3480	0.2589	0.2475	0.1697	0.35	51.52	

Appendix 7: Selke Stakeholder Interest in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.4105	0.1187	0.0979	0.0397		
1	M1	-0.0448	-0.1379	0.7371	-0.4980	10.00	10.00
2	M2	-1.1019	0.0639	0.4620	0.1829	7.00	7.00
3	M3	-1.1542	0.3614	-0.2066	-0.3672	6.00	6.00
4	M4	-1.2703	-0.0595	-0.5960	-0.8345	5.00	5.00
5	M5	1.3411	-0.5728	-0.2525	-0.1584	5.00	5.00
6	M6	1.3411	-0.5728	-0.2525	-0.1584	5.00	5.00
7	M7	1.3411	-0.5728	-0.2525	-0.1584	5.00	5.00
8	M8	-0.8410	-0.7524	-1.9624	0.5878	4.00	4.00
9	M9	-0.0840	-0.2014	0.1643	0.0407	12.00	12.00
10	M10	-0.0642	-0.5711	0.3986	-0.0654	9.00	9.00
11	M11	-0.3225	-0.1750	0.4289	1.0314	9.00	9.00
12	M12	0.2325	0.8963	-0.3430	-0.1142	11.00	11.00
13	M13	0.8269	1.2418	-0.0495	0.2718	8.00	8.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.4105	0.1187	0.0979	0.0397		
1	MOA.E	-0.7432	0.0641	0.4175	-0.3916	8.00	8.00
2	Flood Ag	0.9539	-0.1780	0.0600	-0.5272	8.00	8.00
3	Inst. Ag	-1.0125	0.0553	-0.9370	0.3777	7.00	7.00
4	Off Ag.	-0.5172	0.4574	0.3536	-0.1965	9.00	9.00
5	Hartz Wa	0.7920	-0.2147	0.2056	0.1065	9.00	9.00
6	Hartz Na	-0.8443	-0.1454	-0.5376	-0.6698	8.00	8.00
7	Salzland	0.7920	-0.2147	0.2056	0.1065	9.00	9.00
8	Salzland	0.6539	-0.4128	-0.7528	0.7119	9.00	9.00
9	Farmers	-0.3674	0.8496	0.5447	0.3924	7.00	7.00
10	Trad Ag	-0.9526	-0.5340	-0.2292	0.0488	8.00	8.00
11	Unterhal	1.1045	0.0333	-0.1134	-0.5556	7.00	7.00
12	Cultural	-0.5048	-0.5929	1.4002	0.6942	5.00	5.00
13	Wastewat	0.8267	3.1027	-0.6271	0.3953	2.00	2.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.5627	0.1627	0.1343	0.0544	
1	M1	0.7880	0.4216	0.7093	0.5813	64.03	10.00
2	M2	0.4572	0.4788	0.7870	0.4724	56.59	7.00
3	M3	0.4744	0.4980	0.5644	0.4876	50.73	6.00
4	M4	0.4887	0.3250	0.6608	0.7589	58.25	5.00
5	M5	0.5062	0.4014	0.3967	0.4882	45.08	5.00
6	M6	0.5062	0.4014	0.3967	0.4882	45.08	5.00
7	M7	0.5062	0.4014	0.3967	0.4882	45.08	5.00
8	M8	0.7545	0.5440	1.3737	0.6949	89.93	4.00

9	M9	0.7981	0.4126	0.6168	0.4609	59.16	12.00
10	M10	0.7657	0.4805	0.6490	0.4661	60.33	9.00
11	M11	0.7119	0.4623	0.7271	0.8982	71.69	9.00
12	M12	0.7989	1.1131	0.5484	0.4569	77.25	11.00
13	M13	0.6479	1.3550	0.4316	0.4770	81.70	8.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED		0.5627	0.1627	0.1343	0.0544	
1	MOA.E	0.6213	0.4135	0.5201	0.6055	54.64	8.00
2	Flood Ag	0.7157	0.6887	0.3625	0.4681	57.82	8.00
3	Inst. Ag	0.6560	0.4759	1.0064	0.6425	72.15	7.00
4	Off Ag.	0.6942	0.6223	0.4791	0.5248	58.61	9.00
5	Hartz Wa	0.7197	0.6562	0.3897	0.4138	56.38	9.00
6	Hartz Na	0.6451	0.4932	0.8785	0.6742	68.66	8.00
7	Salzland	0.7197	0.6562	0.3897	0.4138	56.38	9.00
8	Salzland	0.8078	0.7280	0.8459	0.6929	77.11	9.00
9	Farmers	0.6688	0.7692	0.5220	0.5628	63.80	7.00
10	Trad Ag	0.6063	0.4783	0.8316	0.5634	63.35	8.00
11	Unterhal	0.7308	0.6961	0.3616	0.4945	59.03	7.00
12	Cultural	0.4410	0.4397	0.9792	0.7484	69.04	5.00
13	Wastewat	0.4202	2.0410	0.4551	0.3707	108.25	2.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.5627	0.1627	0.1343	0.0544	
1	M1	0.0048	0.0294	0.6680	0.8536	0.27	0.00
2	M2	0.8605	0.8621	0.9360	0.9434	0.90	0.00
3	M3	0.8066	0.8491	0.8618	0.8871	1.06	0.00
4	M4	0.7306	0.7315	0.8100	0.9081	1.42	0.00
5	M5	0.8807	0.9671	0.9823	0.9861	1.31	0.00
6	M6	0.8807	0.9671	0.9823	0.9861	1.31	0.00
7	M7	0.8807	0.9671	0.9823	0.9861	1.31	0.00
8	M8	0.2239	0.3203	0.9158	0.9498	2.02	0.00
9	M9	0.0928	0.3798	0.5535	0.5602	0.05	0.00
10	M10	0.0074	0.3227	0.4623	0.4647	0.36	0.00
11	M11	0.1671	0.1936	0.3380	0.8697	0.40	0.00
12	M12	0.0895	0.8050	0.9002	0.9069	0.39	0.00
13	M13	0.4242	0.9387	0.9395	0.9537	1.03	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.5627	0.1627	0.1343	0.0544	
1	MOA.E	0.1551	0.1537	0.0991	0.0686	0.51	86.52
2	Flood Ag	0.0825	0.0715	0.0704	0.0150	0.67	97.74
3	Inst. Ag	0.3902	0.3892	0.1144	0.0859	1.05	91.79
4	Off Ag.	0.1690	0.0969	0.0578	0.0501	0.34	85.28
5	Hartz Wa	0.0457	0.0298	0.0166	0.0144	0.45	96.79
6	Hartz Na	0.2606	0.2533	0.1628	0.0734	0.72	89.76
7	Salzland	0.0457	0.0298	0.0166	0.0144	0.45	96.79
8	Salzland	0.3514	0.2927	0.1153	0.0144	0.63	97.71
9	Farmers	0.5198	0.2711	0.1782	0.1475	0.61	75.66
10	Trad Ag	0.1662	0.0680	0.0515	0.0510	0.75	93.17
11	Unterhal	0.1760	0.1756	0.1716	0.1101	0.96	88.51
12	Cultural	0.9426	0.8215	0.2079	0.1119	1.11	89.88
13	Wastewat	3.7439	0.4269	0.3039	0.2727	4.18	93.48

Appendix 8: Selke Positionholder Agency in Measures

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Spec: Species scores (Biplot scaling)

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.1579	0.0270	0.0219	0.0078		
1	M1	-0.4970	-0.1088	-0.0966	0.4832	18.00	9.53
2	M2	-0.4970	-0.1088	-0.0966	0.4832	18.00	9.53
3	M3	-0.5460	-0.0960	-0.6732	-0.2291	16.00	8.53
4	M4	-0.5460	-0.0960	-0.6732	-0.2291	16.00	8.53
5	M5	0.7790	-0.3319	-0.5031	-0.2802	16.00	8.00
6	M6	0.6808	-0.3185	0.0546	0.4378	18.00	9.00
7	M7	1.1280	-0.6308	0.0854	-0.0144	15.00	6.82
8	M8	-0.6450	-0.0245	0.3666	-0.0576	18.00	10.12
9	M9	0.0189	-0.0041	0.3348	-0.4667	23.00	11.26
10	M10	-0.3770	0.4671	0.2091	-0.0646	20.00	10.53
11	M11	-0.6450	-0.0245	0.3666	-0.0576	18.00	10.12
12	M12	0.4495	-0.0771	0.5868	-0.0784	17.00	10.70
13	M13	0.9118	1.1353	-0.2361	0.1214	18.00	9.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Samp: Sample scores

N	NAME	AX1	AX2	AX3	AX4	WEIGHT	N2
	EIG	0.1579	0.0270	0.0219	0.0078		
1	MOA.E	0.1038	-0.0894	-0.4024	0.1063	36.00	12.71
2	Flood Ag	0.7744	-0.4775	-0.0969	-0.0460	22.00	10.52
3	Inst. Ag	-0.5847	0.1268	-0.2103	-0.0429	20.00	11.11
4	Offices	-0.5847	0.1268	-0.2103	-0.0429	20.00	11.11
5	Hartz: W	0.5540	-0.1426	0.0169	-0.1387	19.00	11.65
6	Harz: N	-0.4217	-0.0620	-0.1729	-0.0487	21.00	11.92
7	Salzland	0.5540	-0.1426	0.0169	-0.1387	19.00	11.65
8	Salzland	-0.4217	-0.0620	-0.1729	-0.0487	21.00	11.92
9	Farmers	-0.6847	0.3593	0.3765	0.8001	16.00	9.85
10	Unterhal	0.6013	-0.4287	0.9605	0.2906	15.00	9.78
11	Cultural	-0.9549	0.1598	0.8321	-0.7525	13.00	8.05
12	Wastewat	1.5139	1.6974	0.0446	-0.1289	9.00	5.40

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Tol : Species tolerance (root mean squared deviation for species)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2
	FR FITTED	0.7199	0.1231	0.0999	0.0355		
1	M1	0.5985	0.2337	0.3950	0.5520	46.73	9.53
2	M2	0.5985	0.2337	0.3950	0.5520	46.73	9.53
3	M3	0.5961	0.1978	0.6486	0.3526	48.46	8.53
4	M4	0.5961	0.1978	0.6486	0.3526	48.46	8.53
5	M5	0.7393	0.5633	0.5267	0.2808	55.23	8.00
6	M6	0.7186	0.5494	0.3866	0.4590	54.28	9.00
7	M7	0.8305	0.7327	0.4082	0.1438	59.45	6.82
8	M8	0.6656	0.2192	0.5230	0.3820	47.71	10.12
9	M9	0.6543	0.4207	0.5104	0.5199	53.29	11.26
10	M10	0.6827	0.5777	0.4472	0.3657	53.24	10.53
11	M11	0.6656	0.2192	0.5230	0.3820	47.71	10.12
12	M12	0.7108	0.4890	0.6550	0.3058	56.28	10.70
13	M13	0.8906	1.1816	0.3675	0.2491	77.24	9.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
Het : Sample heterogeneity (root mean squared deviation for samples)

N	NAME	AX1	AX2	AX3	AX4	RMSTOL	N2

	FR FITTED		0.7199	0.1231	0.0999	0.0355	
1	MOA.E	0.6534	0.4309	0.5145	0.3161	49.43	12.71
2	Flood Ag	0.7939	0.6048	0.3812	0.2946	55.41	10.52
3	Inst. Ag	0.6179	0.3351	0.4460	0.3101	44.42	11.11
4	Offices	0.6179	0.3351	0.4460	0.3101	44.42	11.11
5	Hartz: W	0.7260	0.4774	0.3834	0.3164	50.05	11.65
6	Harz: N	0.6276	0.3438	0.4256	0.3034	44.31	11.92
7	Salzland	0.7260	0.4774	0.3834	0.3164	50.05	11.65
8	Salzland	0.6276	0.3438	0.4256	0.3034	44.31	11.92
9	Farmers	0.6408	0.4533	0.4796	0.7877	60.55	9.85
10	Unterhal	0.7255	0.5479	0.8685	0.4038	66.03	9.78
11	Cultural	0.6607	0.2336	0.8064	0.7389	64.95	8.05
12	Wastewat	1.0228	1.5673	0.3237	0.2720	95.93	5.40

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
CFit: Cumulative fit per species as fraction of variance of species

N	NAME	AX1	AX2	AX3	AX4	VAR(y)	% EXPL
	FR FITTED		0.7199	0.1231	0.0999	0.0355	
1	M1	0.7974	0.8132	0.8244	0.9918	0.12	0.00
2	M2	0.7974	0.8132	0.8244	0.9918	0.12	0.00
3	M3	0.6168	0.6247	0.9739	0.9980	0.19	0.00
4	M4	0.6168	0.6247	0.9739	0.9980	0.19	0.00
5	M5	0.7748	0.8329	0.9533	0.9755	0.31	0.00
6	M6	0.8251	0.8998	0.9018	0.9775	0.22	0.00
7	M7	0.8504	0.9604	0.9622	0.9622	0.59	0.00
8	M8	0.8766	0.8771	0.9826	0.9841	0.19	0.00
9	M9	0.0035	0.0036	0.4178	0.8975	0.04	0.00
10	M10	0.5270	0.8617	0.9221	0.9255	0.11	0.00
11	M11	0.8766	0.8771	0.9826	0.9841	0.19	0.00
12	M12	0.5728	0.5798	0.9435	0.9474	0.14	0.00
13	M13	0.5981	0.9817	0.9966	0.9990	0.55	0.00

WCanoImp produced data file
CA Canonical axes: 0 Covariables: 0 Scaling: 3
Downweight
No transformation
SqRL: Squared residual length per sample with s axes (s=1...4)

N	NAME	AX1	AX2	AX3	AX4	SQLENG	% FIT
	FR FITTED		0.7199	0.1231	0.0999	0.0355	
1	MOA.E	0.0310	0.0297	0.0057	0.0048	0.04	86.54
2	Flood Ag	0.0461	0.0086	0.0072	0.0070	0.28	97.53
3	Inst. Ag	0.0164	0.0137	0.0072	0.0070	0.15	95.39
4	Offices	0.0164	0.0137	0.0072	0.0070	0.15	95.39
5	Hartz: W	0.0091	0.0057	0.0057	0.0040	0.13	96.95
6	Harz: N	0.0094	0.0087	0.0043	0.0041	0.08	94.87
7	Salzland	0.0091	0.0057	0.0057	0.0040	0.13	96.95
8	Salzland	0.0094	0.0087	0.0043	0.0041	0.08	94.87
9	Farmers	0.1016	0.0804	0.0594	0.0030	0.29	98.97
10	Unterhal	0.1791	0.1489	0.0123	0.0048	0.32	98.51
11	Cultural	0.1594	0.1552	0.0527	0.0027	0.52	99.47
12	Wastewat	0.4763	0.0028	0.0025	0.0010	1.39	99.93

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