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Allison, H.E. and Hobbs, R.J. (2010) Natural resource management at four social scales: psychological type matters. *Environmental Management*, 45 (3). pp. 590-602.

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Natural Resource Management at Four Social Scales: Psychological Type Matters

Journal:	<i>Environmental Management</i>
Manuscript ID:	ENM-08-0185.R2
Journal Article:	Research
Keywords:	psychological type, temperament, Myers Briggs Type Indicator (MBTI®), decision making, natural resource management (NRM), complexity, change, Australia
Abstract:	<p>Understanding organisation at different social scales is crucial to learning how social processes play a role in sustainable natural resource management. Research has neglected the potential role that individual personality plays in decision making in natural resource management. In the past two decades natural resource management across rural Australia has increasingly come under the direct influence of voluntary participatory groups, such as Catchment Management Authorities. The greater complexity of relationships amongst all stakeholders is a serious management challenge when attempting to align their differing aspirations and values at four social institutional scales, local, regional, state and national. This is an exploratory study on the psychological composition of groups of stakeholders at the four social scales in natural resource management in Australia. This paper uses the theory of temperaments and the Myers-Briggs Type Indicator (MBTI®) to investigate the distribution of personality types. The distribution of personality types in decision-making roles in natural resource management was markedly different from the Australian Archive sample. Trends in personality were found across social scales with Stabilizer temperament more common at the local scale and Theorist temperament more common at the national scale. Greater similarity was found at the state and national scales. Two temperaments comprised between 76% and 90% of participants at the local and regional scales, the common temperament type was Stabilizer. The dissimilarity was Improviser (40%) at the local scale and Theorist (29%) at the regional scale. Implications for increasing participation in regional sustainable management practices and bridging the gap between community and government are discussed.</p>

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For Review Only

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6 Natural Resource Management at Four Social Scales:
7 Psychological Type Matters
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12 Short title: Psychological Type in Australian Natural Resource Management
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Abstract

Understanding organisation at different social scales is crucial to learning how social processes play a role in sustainable natural resource management. Research has neglected the potential role that individual personality plays in decision making in natural resource management. In the past two decades natural resource management across rural Australia has increasingly come under the direct influence of voluntary participatory groups, such as Catchment Management Authorities. The greater complexity of relationships amongst all stakeholders is a serious management challenge when attempting to align their differing aspirations and values at four social institutional scales, local, regional, state and national. This is an exploratory study on the psychological composition of groups of stakeholders at the four social scales in natural resource management in Australia. This paper uses the theory of temperaments and the Myers-Briggs Type Indicator (MBTI[®]) to investigate the distribution of personality types. The distribution of personality types in decision-making roles in natural resource management was markedly different from the Australian Archive sample. Trends in personality were found across social scales with Stabilizer temperament more common at the local scale and Theorist temperament more common at the national scale. Greater similarity was found at the state and national scales. Two temperaments comprised between 76% and 90% of participants at the local and regional scales, the common temperament type was Stabilizer. The dissimilarity was Improviser (40%) at the local scale and Theorist (29%) at the regional scale.

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3 Implications for increasing participation and bridging the gap between
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6 community and government are discussed.
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8 **Keywords:** Psychological type, temperament, Myers Briggs Type Indicator
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10 (MBTI[®]), decision making, natural resource management (NRM),
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12 complexity, change, Australia
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3 Some scientists and policy makers have expressed frustration at the
4
5 observed low levels of adoption of natural resource management practices
6
7 (Pannell and others 2006). Mechanisms for decision making in natural
8
9 resource management must accommodate the varying viewpoints, interests
10
11 and goals of diverse stakeholders (Senge 1992; Vance and others 2007). To
12
13 accommodate this diversity, participatory and adaptive management
14
15 processes have been adopted in natural resource management in Australia as
16
17 the preferred decision making methods to try to increase the participation
18
19 rate in an ethical systems-based approach (Allison and Hobbs 2006).
20
21 Together these have been identified as adaptive co-management (Plummer
22
23 and Armitage 2007) in pursuit of sustainable resource use and social-
24
25 ecological resilience. Increasing participation across all social scales in a
26
27 system is a prerequisite to move towards sustainable natural resource
28
29 management (Rockloff 2003). Participatory management involves being
30
31 open to and examining the position of all stakeholders including their
32
33 beliefs, cultures, values and ways of knowing. However, operating in this
34
35 new way challenges the capacity of individuals and groups to deal with
36
37 complex or wicked natural resource management problems (Harris 2007;
38
39 Plummer and Armitage 2007) and to understand and accept the multiple
40
41 perspectives of all stakeholders. Individuals are inevitably part of groups
42
43 and the social capacity of the group is dependent both on the capacity of
44
45 individuals and the institutional system. This is a commonly overlooked yet
46
47 pervasive problem in the social sciences most regularly referred to as the micro-
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49 to-macro problem (Goldspink and Kay 2004). People and institutions have
50
51 different characteristics which make it difficult to act in a holistic way, and
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3 so if we are to tackle wicked natural resource management problems at the
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5 regional scale we need to build human psychological capacity in the whole
6
7 social system. This in turn requires an understanding of the role that
8
9 individual psychological characteristics might play in how people make
10
11 decisions both individually and in various hierarchical group levels.
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15 Management of natural resources is predominantly practiced through nested
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17 institutional scales (e.g. local, regional, state, national). Community -
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19 government partnerships provide an operating framework for collaboration
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21 which provides an arena for citizens to negotiate and engage in trade-offs
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23 with the main power players who hold the resources. Consequently, the
24
25 relationship between scale and policy, if any consistent relationship exists,
26
27 must involve a value judgment about whether a selected scale leads to an
28
29 appropriate decision. Understanding social organisation at different scales is
30
31 an important aspect to learn how social processes play a role in sustainable
32
33 natural resource management.
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39 A significant scale issue is that natural resource management problems
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41 involve an asymmetric problem in decision scale. Actions that are rational
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43 from an individual viewpoint at the local or farm scale may not contribute to
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45 the goal on a larger geographical and more long-term temporal scale. There
46
47 is a social trap inherent between the scale of individual concern and the
48
49 scale at which landscape natural resource management problems emerge
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51 (Rykiel Jr. 1998). A major challenge confronting community-government
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53 partnerships is bridging the divide between government agencies at the state
54
55 and national scales and communities at the local and regional scales
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59 (Rockloff 2003).
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3 Participation by land owners and regional natural resource management
4 groups is pivotal to social sustainability (Rockloff 2003) which underpins
5 sustainable natural resource management. Representation, leadership and
6 partnerships are important factors that contribute to participation, which
7 needs to be encouraged at different spatial scales in order that decision
8 making accounts for the ecological processes at the landscape scale rather
9 than only farm-scale processes. Capacity building and empowerment at
10 appropriate scales are also important. Here, we extend Rockloff's (2003)
11 conceptual framework for social sustainability to bridge this gap and
12 examine how an individual's personality type at the micro level may
13 influence how they participate at the macro level (Figure 1).
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29 In this study we use both the MBTI Instrument (Myers and others 1998) and
30 temperament theory (Berens 2006; Keirsey 1998) to investigate the range of
31 personality type in people with decision-making roles across four social
32 scales in natural resource management across Australia. Three
33 circumstances make this topic particularly relevant to management of
34 natural resources in Australia. Firstly, as a federated country responsibility
35 for natural resources rests constitutionally primarily with the states not the
36 national government, and secondly negotiated arrangements between the
37 financial power (national) and legislative power (states) are the norm. The
38 consequence of these arrangements is a plethora of stakeholders across all
39 institutional scales (Figure 2). Thirdly, in the broad acre regions of rural
40 Australia populations are declining and farmer age continues to increase,
41 suggesting the potential loss of diversity and social capacity (Shepherd
42 2005).
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3 During the past two decades the Australian Government (national)
4 established a program for investing in natural resource management in
5 association with state and territory governments through a series of
6 agreements (Allison and Hobbs 2006). A range of coordinating and steering
7 groups were also set up to facilitate these agreements through the
8 implementation of strategies and investment plans with regional natural
9 resource management groups. Research and development organisations and
10 non-government organisations also play vital roles. Over the past 20 years
11 much of the responsibility for the planning and implementation of natural
12 resource management in Australia has moved away from state level control
13 to devolution to a network of 56 regional community-based groups across
14 Australia established under policy agreements. Figure 2 shows the
15 institutional and hierarchical nature of the natural resource management
16 system. There are many stakeholders who play a role in decision making in
17 natural resource management within and across scales. This is a rich mix of
18 individuals making decisions at the micro level that make up social systems
19 that influence the range and type of macro level phenomena that arise from
20 their interaction (Goldspink and Kay 2004).
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45 The national and state governments provide funding under a suite of
46 programmes including the Natural Heritage Trust and the National Action
47 Plan for Salinity and Water Quality, recently reviewed by Robins and
48 Dovers (2007) and Pannell and Roberts (2008). The Natural Heritage Trust
49 was replaced in 2008 by Caring for Our Country. This evolving policy is an
50 integrated package aimed at achieving a business approach to investment,
51 clearly articulated outcomes and priorities and improved accountability. The
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3 goal is “An environment that is healthy, better protected, well-managed,
4 resilient, and provides essential ecosystem services in a changing climate” .
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8 This new policy continues to encourage partnerships between key
9 stakeholders as the means through which sustainable land management
10 practices will be achieved and provides 15% of the 2009-2010 budget to
11 capacity development (Australian Government 2008). Two of the five year
12 outcomes are to assist at least 30 per cent of farmers to improve their
13 knowledge, skills and engagement with the assumption that it will increase
14 their uptake of sustainable farm and land management practices that deliver
15 improved ecosystem services (Australian Government 2008).
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20 Adaptive management has been promoted as offering a way to work within
21 natural resource management situations that have the inherent
22 characteristics of complexity and uncertainty. It has been adopted as a
23 preferred approach in Australia (Natural Resource Management Ministerial
24 Council 2006). However, over the past 100 years Australia has created
25 informal and formal rules about natural resource management which are
26 inconsistent with adaptive management as a process. Allan and Curtis
27 (2005) concluded from their research in two regional case studies in eastern
28 Australia that there were major constraints to practicing adaptive
29 management at the regional scale as it does not fit with the dominant
30 approach by land holders. The constraints were identified as unspoken
31 assumptions or agreed “plots” that underlie management practices by land
32 holders and government agencies which are the norms that have arisen over
33 time. A natural resource management culture exists that values activity,
34 control, comfort, and clarity over reflection, learning, and embracing
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variability. In some instances this has also been described as ‘group think’ where group members see benefits that emerge from group cohesion (Janis 1971). However, there are also disadvantages in the characteristics of group think which may create obstacles for change and innovation when alternative multiple perspectives are not valued or accepted. Potentially these cultural norms are consistent with the notions of judgmental discounting and environmental risk perception in human decision-making that centre on outcomes that occur to us, here, now, and for sure (Gattig and Hendrickx 2007). Consequences that deviate in one or more of these aspects are valued less, that is, they tend to be discounted.

Adaptive management involves a change in the way people perceive the world around them and how they think and understand the relationship of the factors that influence change, including cause and effect, and consequently how they make decisions (Allison and Hobbs 2006). If people’s learning has not caused them to change their mental models, worldview or how they believe the world to work then adaptive management is no better at removing single solution policy or panaceas than any alternative management process (Brock and Carpenter 2007). Therefore if practiced from within the wrong theoretical construct or norm adaptive management is unlikely to be successful.

Only relatively recently has Australian natural resource management policy acknowledged the importance of social factors and has still to recognise the role that human difference might contribute to the rate of participation. In 2005 the National Land and Water Resources Audit (2005) included a new program to develop a set of indicators for monitoring community and social

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3 processes relevant to, or affected by natural resource management programs.
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5 These indicators pertain to: the capacity of land managers to change and
6
7 adopt sustainable management practices; the capacity of regional groups to
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9 make decisions on natural resource management, including the impact of
10
11 institutional change/responsiveness; and the link between community
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13 vitality, viability and health and natural resource condition. The new model
14
15 for natural resource management outcomes will depend on how well the
16
17 creation of social capacity is managed across all scales of society to align
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19 differing aspirations and values. This is a complex inter-relationship of
20
21 many individuals and groups and the alignment of aspirations and values
22
23 may take some time to develop (Harris 2007). Currently an individual's
24
25 personality type is not included as a factor in Australian Government policy
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27 such as Caring for Our Country (Australian Government 2008) that might
28
29 contribute to participation leading to sustainable land management.
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36 Personality and human traits are important in what an individual perceives
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38 and how they make decisions. Perceiving involves all the ways of becoming
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40 aware of things, people, happenings, or ideas. Judging involves all the ways
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42 of coming to conclusions and making decisions about what has been
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44 perceived. If people differ systematically in what they perceive and in how
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46 they reach conclusions then it is only reasonable for them to differ
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48 correspondingly in their interests, reactions, values, motivations and skills
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50 (Myers, McCaulley, Quenk and Kammer 1998). Since natural resource
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52 management is the result of numerous individual decisions of landholders
53
54 and organisations then it is essential that we investigate how decisions are
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56 made on a conceptual basis. Here, we seek to better understand the current
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3 distribution of personality types in the Australian natural resource
4 management decision-making groups.
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8 9 **Different cognitive styles between individuals**

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11 In the fields of memory, cognition, concept formation and problem solving
12 two different types of cognitive processes have been recognised (Beyler and
13 Schmeck 1992). The one traditionally emphasised is most commonly called
14 analytic, rule-based, or schema-based, while the other is given the labels
15 such as holistic, episode-based, analogy-based, or simply 'nonanalytic'
16 (Brooks 1978). A preference for one of these cognitive styles will have far
17 reaching effects on how individuals learn (Beyler and Schmeck 1992), how
18 individuals see and interpret the world around them and how they make
19 their decisions. Holistic processes seem to involve habitual preferences for a
20 broad focus of attention, formation of impressions, noticing similarities,
21 more interest in wholes than in component parts, and preferences for more
22 random less orderly presentation of information. Analytic processing
23 involves a narrower focus of attention, retention of facts and details,
24 noticing differences, more interest in parts than wholes, and preference for
25 ordered (usually sequential) presentation of information (Beyler and
26 Schmeck 1992).
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49 When considering personality and individual difference a number of
50 instruments have been designed to measure normal range personality (Boyle
51 and others 2008). A major research effort and debate in personality
52 psychology has been the quest to determine the optimum number of traits
53 and an appropriate assessment method. Some of these are the five-factor
54 model or "big five" (DeYoung and others 2007), NEO Personality Inventory
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3 (Costa Jr. and others 1991), Cattell's 16 personality factors questionnaire
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6 (Cattell and Mead 2008), Personality Self-Portrait Inventory (Shrapnel and
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8 Davie 2001) and by the Myers-Briggs Type Indicator (MBTI®). Usually
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10 personality instruments have been criticized because of their permanent trait
11
12 approach. Other researchers recommend using multiple-model methods
13
14 such as the five lenses of type in the Interstrength Method (Berens 2008)
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16 using the relationship of 16 whole types, the four temperaments, four
17
18 interaction styles, cognitive dynamics and type development, and the
19
20 systemic or environmental influences. Greater depth of understanding can
21
22 be gained by knowledge of more than one instrument even if they are not
23
24 used in combination. One advantage of the MBTI® is the dynamic and
25
26 positive approach as well as steady theory behind it. The MBTI® has quickly
27
28 become one of the world's most widely used tools when defining
29
30 personality (Myers, McCaulley, Quenk and Kammer 1998). Owing to its
31
32 usefulness and comprehensible approach it has become a common method
33
34 when studying organisations (Hautala 2006). Like any dominant paradigm,
35
36 the MBTI® has drawn its fair share of criticisms and proposals for
37
38 alternatives. Nonetheless, it has proved extremely useful in providing a
39
40 common language for researchers in organisational personality research.
41
42 The widely used MBTI® was selected for use in this study informed by the
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44 theory of temperament (Keirse 1998) and validation evidence for the
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46 MBTI® is extensive (Bayne 1995; Myers, McCaulley, Quenk and Kammer
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60 1998).

Myers-Briggs Type Indicator (MBTI®)

The need to better understand individual decision making has led a growing number of managers and researchers to employ the Myers-Briggs Type Indicator (MBTI®) to explain differences in decision-making processes and outcomes (Volkema and Gorman 1998). Individuals with different personalities approach a problem or issue in very different ways. A person's personality is comprised of many psychological facets that are interrelated in a complex and unique way. Although it is not possible to capture all of these facets in any one analytical tool, this paper describes the MBTI®, as one well-established tool that identifies different individual preferences, as an initial entry point to an area of research that has been neglected in natural resource management.

The noted psychiatrist C. J. Jung suggested many years ago that certain aspects of human behaviour are predictable and classifiable. From his observations, Jung found predictable and differing patterns of normal behaviour. He developed a theory that there are predictable differences in the way people prefer to take in information, organise the information, and reach conclusions. The practical application of Jung's work has been greatly enhanced by the development of the MBTI® questionnaire (Myers, McCaulley, Quenk and Kammer 1998). The MBTI® is now used as an important tool in careers choice, communication strategies and team development.

The MBTI® identifies four separate dichotomies: Extraversion (E) / Introversion (I); Sensing (S) / Intuition (N); Thinking (T) / Feeling (F); and Judging (J) / Perceiving (P) (Myers, McCaulley, Quenk and Kammer 1998).

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3 An individual is assumed to have a preference for one of each pair of
4 opposites (dichotomies) over the other. The four preferences direct the
5 characteristic use of perceiving and judging by an individual. The particular
6 preferences that interact in a person affect not only what is attended to in
7 any given situation but also how conclusions are drawn about what has been
8 perceived. It is important to note that a preference for one alternative of each
9 dichotomy does not mean that the opposite, less preferred alternative is
10 never used. A preference in one dichotomy is designed to be
11 psychometrically independent of the preferences on the other three
12 dichotomies. Therefore preferences on the four dichotomies yields 16
13 possible combinations called types (Table 1), which are denoted by the four
14 letters identifying the preferences (e.g. ESTJ, INFP). People with similar
15 preferences tend to have similar attitudes, behave in similar ways, and
16 choose similar occupations (Myers, McCaulley, Quenk and Kammer 1998).
17
18 People with preferences for extraversion (E) are those who take a broad-
19 brush approach to life with quick action and who are energised by people
20 and things in the external world. In comparison people with preferences for
21 introversion (I) are reflective and more energised by ideas in their inner
22 world. Perceiving styles are divided into sensing (S) in which people have a
23 preference for facts, details and reality, and intuition (N) in which people
24 have a preference for ideas, implications and possibilities. The decision-
25 making process for those with thinking (T) preferences is objectively based
26 on logic and analysis and for those with a preference for feeling (F) there is
27 a greater emphasis on personal values involving societal and human factors.
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29 The fourth dimension reflects a person's lifestyle attitude: the judging
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3 preference focuses on planning and deciding, looking for closure whereas
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5 the perception (P) preference is more orientated to change, possibilities and
6
7 new developments (Hirsh and Hirsh 2007).
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10 11 **Temperaments**

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14 Temperament theory was popularized by Keirsey (1998) and more recently
15
16 by Berens (2006). Two combinations of the functions and two combinations
17
18 of perception and orientation to the outer world are also used to identify four
19
20 different temperaments (NF, NT, SJ and SP) (Keirsey 1998). Type theory
21
22 and temperament theory are two separate systems for explaining personality
23
24 that were independently developed (Keirsey 1998). Keirsey (1998) argues
25
26 that the 16 types can be clustered into four groups or temperaments that
27
28 were more convenient to use. The four temperaments are light years apart in
29
30 their attitudes and actions. Over the years people have called the four
31
32 temperaments by many names, here I adopt the names used by Berens
33
34 (2006). The four temperaments are Stabilizer (sensing - judging - SJ);
35
36 Improviser (sensing-perceiving - SP); Theorist (intuiting-thinking NT); and
37
38 Catalyst (intuiting-feeing (NF) (Table 2). The two models MBTI[®] and
39
40 temperaments meet at the level of the 16 type patterns. Each of the four
41
42 temperament patterns has four of the 16 variations of the type code (Table
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2). A brief description of each of the temperaments is given in this table.

Those with a Stabilizer temperament are task orientated, practical, and
realistic, inclined to quickly solve problems through established policy or
procedure. They are the most common temperament among supervisors and
managers (Myers, McCaulley, Quenk and Kammer 1998). Those with an
Improviser temperament are resourceful hands-on problem-solvers, who

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3 also prefer immediate or short-term solutions but are willing to take risks.
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5 Those with a Theorist temperament are conceptualizers, who see the big
6
7 picture, and often can provide insight into the internal logic and underlying
8
9 principle of systems and organisations. Those with a Catalyst temperament
10
11 also have the ability to see possibilities, but are focussed more on people
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13 and institutions than ideas and concepts. They are generally articulate,
14
15 persuasive and quick to draw out the best in others (Myers, McCaulley,
16
17 Quenk and Kammer 1998).
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23 **Research methods**

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25 As a baseline for comparison, the MBTI[®] Australian Data Archive (Ball
26
27 2001) was used to provide a base sample of people in Australia. It contains
28
29 data that come from both rural and urban areas and all social scales and
30
31 occupational classifications are included consistent with the range in our
32
33 sample, but as with the present study was conducted on a voluntary response
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35 basis using a standard questionnaire.
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40 Our sample consisted of 413 people drawn from the four social scales for
41
42 decision making on natural resource management across Australia. The
43
44 sample was selected based on their positions and therefore their capacity
45
46 and influence to make change in natural resource management through their
47
48 responsibilities for decision making, implementation, planning, strategy, and
49
50 coordination and facilitation. The following four social scales of decision
51
52 makers: individual (farmers); regional (senior officials of regional
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54 catchment groups); state (senior official); and national (senior officials,
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56 board members of research and development organisations and non-
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58 government organisations). These data were collected from March to May
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2006. In total there were 44 occasions in which people held a position in more than one group in some cases one person held four positions at the state scale. Of the total number invited to participate 75% were male and 25% were female. These proportions reflect the composition structure of gender in the whole sample.

Administration of the MBTI[®] questionnaire

The Myers Briggs Type Indicator Form M was sent to selected participants in accordance with the protocols for the administration of this questionnaire (Myers, McCaulley, Quenk and Kammer 1998). In mail questionnaires the percentage of returns is affected by two key factors, the characteristics of the respondent and the basic considerations of the method (Norman 1948). Leitner and others (1979) categorised the basic consideration of the method into three groups; physical features, content and administrative methods. Also important features are the accompanying letter, the follow up process, and knowledge concerning the sender (Dillman 2007). A modified Dillman method (Dillman 2007) was used to maximise the return rate. A letter of introduction with a description of the research was included with a reply paid envelope. The letter indicated that a copy of the summary report would be sent on completion of the study. A summary of the instructions was included emphasising that participation was voluntary and was conducted within the ethics policy of our institution. Follow up telephone calls were made when the response rate dropped off after 10 weeks to those that had not responded.

The questionnaires were scored using hand scoring templates and a report was completed for each person. The report indicated the person's

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3 preferences and preference clarity category (slight, moderate, clear or very
4 clear). As the respondent is the judge of the accuracy of the results a report
5 was sent to each respondent and they were asked to verify their reported
6 type. In addition a summary report of the overall results for the study was
7 sent to each person that responded.

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10 Analysis of the data was conducted using the Selection Ratio Type Table
11 Program distributed by the Centre for Applications for Psychological Type
12 which allows for convenient analysis of type data. In this program a chi-
13 square statistic is calculated for the hypothesis test which tests to see if the
14 observed frequencies are the same or different that the expected frequencies.

25 26 27 **Base sample**

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29 Figure 3 shows the frequency distribution from the accumulated records in
30 the MBTI[®] Australian Data Archive with profiles of 6507 females and 7569
31 males (total 14,076) ordered by sequence of the male types (Ball 2001).
32 The data show that there are significant differences in the reported
33 frequencies between genders for all 16 types (Ball 2001). Neither males nor
34 females showed an equal distribution among all the sixteen types. All 16
35 male types showed a wider range of relative group sizes than did females
36 types. For males four groups made up around 50% of the sample. The
37 largest group was ISTJ that made up 21.6%, followed by ESTJ 16.2%, INTJ
38 8.9% and ENTJ 8.4. In comparison for females six groups made up around
39 50% of the sample. The largest group for females was ISFJ (13.2%),
40 followed by ISTJ (10.1%), ENFP (8.3 %), INFP (8.1%), ESTJ (8.0%) and
41 ESFJ (8.0%). The smallest group for males was ESFP (1.2%) and for
42 females ESTP (2.5%). Figure 4 shows the frequencies of the four
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3 temperaments in the Australian Archive sample. The most frequent
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5 temperament was Stabilizer (42%). The frequencies decreased in the order
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8 Theorists (24%), Catalyst (19%) and Improviser (13%).
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10 11 **Results**

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14 In our survey, a return rate of 29.3% was obtained (121/413), with more
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16 women (46%) responding than men (31%). Table 3 shows the numbers of
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18 each Type that responded. Figure 5 shows the frequency distribution of the
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20 16 Types in the sample of decision makers in natural resource management
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22 in Australia. The frequencies in Figure 5 are ordered on the male frequency
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24 of the MBTI® Australian Data Archive Sample given in Figure 3 for
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26 comparative purposes. There are clear differences in the overall pattern of
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28 type distribution from the Australian Data Archive Sample. Unlike the base
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30 sample, the results showed that for both males and females four types made
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32 up around 50% (51.9%), these were ENTJ (15.2%), ENFP (13.9%) and
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34 ISTJ (12.7%) and ESTJ (10.1%) for males. For females these were ENTP
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36 (19.1%), ENTJ (14.3%) ENFP (14.3%) and INTJ (11.9%) making up almost
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38 50% of the sample (46.5%). These data for the female sample were not
39
40 consistent with the Australian Archive sample for females. The females
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42 showed a reduce spread of type, only four rather than six groups making up
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44 the 50% of the sample. Using the Selection Ratio Type Table Program there
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46 was no significance difference between males and females for any of the 16
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48 Myers Briggs types, probably because of the small sample size, so males
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50 and females were grouped for further analyses. Figure 6 shows the
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52 distribution of the 16 types for males and females combined. The type
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54 frequency distribution differs from the Australian Data Archive sample
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3 showing a degree self selection. Because of the low sample numbers rather
4 than look at 16 whole types it is useful to use the lens of the four
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8 temperaments to identify differences in trends or patterns of type
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11 distribution.

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13 Using the lens of temperament (Figure 7) a clear picture of the way in which
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Using the lens of temperament (Figure 7) a clear picture of the way in which social scale differences appear in the data. At the local and regional scales between Stabilizers show high frequency, 50% and 46% respectively. At the State and national scales the frequency reduced to 21% and 15% respectively. In contrast the theorist temperament showed the lowest frequencies at the local and regional scale (10% and 29% respectively) and the highest frequencies at the state and national scales (40% and 57% respectively).

At the four social scales two temperament styles made up between 70% - 90% of the participants. The split between temperaments was different at each scale except for state and national scales. At the local scale 90% of the participants in this study comprised of two of the four temperament styles, Stabilizer (50%) and Improviser (40%). Theorist comprises only 10% and Catalyst temperament style is absent. At the regional scale two temperaments made up 76% of the population Stabilizer (47%) and Theorist (29%). At the state and national scales the same two temperaments styles made up 70% and 83% of the participants respectively. At the state scale the composition was Theorist (40%) and Catalyst (30%). At the national scale the composition was Theorist (57%) and Catalyst (26%).

Discussion

Our primary purpose in this research was to investigate personality and type diversity in a range of participants in decision making in natural resource management across Australia at four social scales. Knowledge of personality and individual difference either through knowledge of the 16 Types or the four temperaments is a useful framework for explaining different organizing principles of human nature. This organizing framework adds a further dimension to the conceptual framework in which we link personality through the process of decision making and organising at different scales focussing on key factors that are involved with participation to achieve the desired outcomes of social and natural resource sustainability (Figure 1).

Increasing participation in sustainable land management practices has been a target for the Australian Government since the inception of Landcare in the late 1980s leading to the Decade of Landcare 1990-2000, a community voluntary participation program. In the latest policy in this genre “Caring for Our Country Business Plan 2009-2010” (Australian Government 2008) Government has set a target of assisting at least 30% of farmers (42,000 - 12,000 in cropping industries including horticulture and 30,000 in grazing industries) (Australian Government 2008) over the next five years in target regions to adopt sustainable land management practices. Change in land management practices is slow and it is unlikely that community voluntary participation on its own will be effective for solving catchment scale natural resource problems (Allison and Hobbs 2006).

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3 Pannell and others (2006) in a wide review of conservation practices in
4 farmers across Australia reported that adoption depends on a range of
5 factors social, cultural and economic factors. Adoption is increased when
6 the landholder perceives that the innovation in question will enhance the
7 achievement of their personal goals. Non-adoption or low adoption of a
8 number of conservation practices is readily explicable in terms of their
9 failure to provide a relative advantage (particularly in economic terms) or a
10 range of difficulties that landholders may have in trialling them. It is
11 suggested that there remained a lack of recognition of the supremacy of
12 social and human capital, particularly in local groups (Pretty and Howard
13 2001) and our capacity to explain the relationship between human capital
14 and social capital (Goldspink and Kay 2004).

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The participation and retention of farmers practicing sustainable farming practices will be influenced by their human capital including their personality type and temperament as well as other contextual factors including extension methods. Personality may potentially play a major part in the style of decision making used by farmers and other landholders, and the propensity to become involved in collective action. The slow uptake of community voluntary participation may be especially problematic in a culture and society that values individuality and freedom of expression compared with cooperative joint group behaviour (Pannell 2005). These two ways of acting are related to psychological type preferences demonstrated by the trends in the data.

The distribution of psychological types in the natural resource management decision makers is markedly different from the MBTI[®] Australian Data

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3 Archive which sampled a larger population across Australia. If
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6 psychological type was not a factor then one would hypothesise that the
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8 same distribution would be found both in the base population and the
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10 sample population. The results of this study are consistent with previous
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12 studies that show people self select for their profession (Myers, McCaulley,
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14 Quenk and Kammer 1998) and that men and women report similar
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16 distributions in the same occupational type if that occupation is open to both
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18 genders (Myers, McCaulley, Quenk and Kammer 1998). For example there
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20 was a reduced spread in the data for women in this study compared with the
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22 Australian data Archive.
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27 In the whole sample there is a marked absence of people with ISFP, ESTP
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29 and ISTP preferences, that is the Improviser temperament style. Some
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31 contend that people with the Improviser style are underrepresented in the
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33 Australian Data Archive (Ball 2009). It is not clear whether the lack of this
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35 temperament style is a true representation of the distribution or a bias due to
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37 the voluntary basis of the administration of the questionnaire. In mail
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39 questionnaire the percentage of returns is affected by two key factors, the
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41 characteristics of the respondent and the basic considerations of the method
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43 (Norman 1948). The results therefore may be biased because people with
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45 certain preferences may be more influenced to participate whilst those with
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47 other preferences may be less inclined to respond for a number of reasons,
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49 such as: it is not of importance to them, it is not important in the here and
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51 now, or they may perceive the information as of a personal nature. None-
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53 the-less the greatest percentage of this type who responded to the
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55 questionnaire is found at the local scale. Improvisers are resourceful hands
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3 on problem-solvers, who also prefer immediate or short-term solutions but
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5 are willing to take risks.
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8 The snapshot of the Stabilizer temperament (Table 2) indicates that people
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10 with this temperament, in general view life as a process of establishing
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12 stability in order to responsibly cultivate an preserve resources and
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14 relationships (Berens 2006). They have a predisposition for observing and
15
16 preserving the concrete “realities” of the present in relation to the past.
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18 Stabilizers work hard to enforce laws that govern action, insisting that only
19
20 by establishing and obeying rules and regulations can we hope to maintain
21
22 civil order. It is common for Stabilizers to seek out the responsibility of
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24 command. Activities that foster the presence of order security that keeps life
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26 simple and ensure the continuation of the world as it is known is important
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28 to people with the Stabilizer temperament.
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34 A snapshot of the Theorist temperament indicates that people with this
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36 temperament in general view life as a process of understanding or
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38 developing underlying theories for the pragmatic or strategic advantage such
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40 knowledge can give an individual or group (Berens 2006). Born with a
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42 predisposition for the complex, they tend to focus on patterns and “think
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44 systems” both technical and social, and move with ease from the big picture
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46 to the minute details of ideas and situations. People with this temperament
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48 talk little of what is observable and much of what is imaginable. They are
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50 inclined to talk of conceptual things, ideas rather than objects. Theorists
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52 choose the imaginative, conceptual, inferential things to speak of over the
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54 observational, perceptual, or experiential.
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3 The two temperaments styles Improviser and Catalyst, in absolute numbers
4 were the least well represented in the natural resource management decision
5 makers. People with the Improviser temperament tend to be action
6 orientated and gifted at tactics (Keirsey 1998). In general, people with an
7 Improviser temperament view life as a process of varying behaviour and
8 using whatever is at hand to make things work. They are born with a
9 predisposition for keen observation of the tangible specifics in the present
10 moment they are ready to make instantaneous decisions among an array of
11 options. They are particularly aware of sensory information and vary their
12 actions according to the needs of the moment.
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27 People with the Catalyst temperament are considered to be idealists. To
28 them life is a process of cultivating relationships, pursuing self-actualization
29 and developing the potentials of those around them. They are born with a
30 predisposition for the abstract, global and personal. They tend to focus on
31 human potential, ethics, culture, quality of life, metaphysical and personal
32 growth (Berens 2006). Their core needs are for the meaning and
33 significance that come from having a sense of purpose and working towards
34 some greater good. They also prefer cooperative interactions with a focus on
35 ethics and morality.
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49 Personality type is likely to make a difference in how we address change
50 (Russell 2006). Australian rural systems are facing change in bio-physical,
51 social and knowledge management factors. The amount of information and
52 rates of change are rapidly increasing, impacting both on the development
53 and the implications of policy as well as how rural land holders make
54 decisions.
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3 No other study has collected personality data about natural resource
4 decision makers across the local, regional state and national scales. Rural
5 sociology has not emphasised individual personality traits in seeking to
6 understand the complexity of the human-environment relationships which
7 determine land use (Shrapnel and Davie 2001) nor has personality been
8 invoked in assessing the potential of landholders to adopt more sustainable
9 land management practices. Nor has personality and human differences
10 been used to investigate how people with different personality types come
11 together in an adaptive management framework to manage natural resource.
12 However, there have been a number of studies on personality type of people
13 in agricultural in relation to management and leadership styles. Our results
14 reinforce findings from other studies. Strachan (2006) reported on the
15 distribution of psychological type and temperaments of 2661 persons
16 employed on farms across eight agricultural industries throughout Australia.
17 A high proportion (55%) had a Stabilizer temperament style and, for 1512
18 managers and supervisors employed in agriculture, introversion (I) was a
19 feature of those in management positions. He considered that the high
20 proportions with a preference for thinking (T) (85%) and judging (J) (67%)
21 were significant and likely to impact on the leadership styles of those in
22 authority. Strachan (2006) proposed that the high proportion with a
23 Stabilizer temperament among those in authority on farms had implications
24 for the lack of change. In a survey of the psychological profiles of
25 Australian farmers and researchers, Foster and Rogers (1998) reported a
26 high proportion (49%) of Stabilizer temperament among the farmers in
27 Queensland and an Stabilizer – Theorist temperament split between farmers
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3 and researchers respectively. A Stabilizer temperament ‘culture’ has been
4 described as ‘traditional’ and one that tends to resist change (Keirseey and
5 Bates 1984). Shrapnel and Davie (2001) also found that of the 14
6 personality types recognised using the Personality Self-Portrait Inventory
7 only five were represented in a group of 60 rural land holders involved in
8 grazing and mixed cropping in Queensland.
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18 In the cultural context rural communities tend to value projects that are
19 straight forward, technically framed and promote and facilitate on-ground
20 activity consistent with the Stabilizer temperament. However this worldview
21 may once have been appropriate when the future could be predicted from
22 past trends. Historically human actions were local, confined and relatively
23 small, so as not to change the ecological system. Cause and effect were local
24 and data could be used to assess the probability of the same event occurring
25 in the future. The weakness of this way of thinking is that it assumes that the
26 environment is statistically stationary. Land use change is now so extensive
27 as to strongly affect the natural resources for example causing loss of
28 biodiversity, disruption of surface aquifers, soil erosion and salinity.
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People’s behaviour is focused on consuming at scales thought unimaginable
only a few tens of years ago. When human actions cause changes at larger
scales quite different ways of knowing are required. Ways that encourage
reflection and learning, and multiple ways of knowing (Allan and Curtis
2005).

56 **Conclusion**

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Whilst it is easy to over-generalize about some behaviours of the four
temperaments to the detriment of the real appreciation of individual

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3 differences, by applying the temperament and 16 types frameworks in an
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5 inquiring approach we can use it constructively to understand differences in
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7 a general way. A major challenge confronting community-government
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9 partnerships is bridging the divide between government agencies at the state
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11 and national scales and communities at the local and regional scales
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13 (Rockloff 2003). Using temperament as a lens identifies fundamental
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15 differences in worldview as one contributing factor to the community-
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17 government divide. Encouraging knowledge and understanding of
18
19 individual personality and human differences will be an important step to
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21 achieve the Australian Government's goal of increasing participation in
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23 sustainable land management practices.
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29 The gap may be increasing because of the increasingly complex
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31 environment of decision making in natural resource management which
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33 requires both analytical and integrated or holistic approaches to clarify
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35 objectives, uncover hidden opportunities, systematically investigate and
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37 resolve stubborn problems and reach difficult decisions complicated by a
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39 variety of stakeholders (Senge 1992; Vance, Groves, Paik and Kindler
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41 2007). Although the results show that there is a spread across the 16
42
43 personality types and four temperaments the distributions are not evenly
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45 distributed across groups at the four scales. In general there was reverse
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47 trends for the Stabilizer and Theorist temperaments across the scales. The
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49 Stabilizer temperament was more common at the rural local scale and less
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51 common at the national scale. Conversely people with the Theorist
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53 temperament were more common at the national scale and work in the
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55 policy environment. This may present some difficulty and create conflict
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3 when decisions have to be negotiated as the core needs or driving forces and
4 values and goals of the two temperaments are different. The consequence is
5 that each temperament will see a different perspective, take a different
6 approach to the same situation and is likely to drive people to propose
7 different solutions to same problems. The lack of people with the Catalyst
8 temperament at the local and regional scales will have implications for
9 collective activity. People with the Catalyst temperament have a need for
10 meaning and significance that comes from have a sense of purpose and
11 working toward some greater good. The temperament styles of Stabilizer
12 and Improviser will be more evident.
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26 Our study has provided only a preliminary analysis of the likely role of
27 psychological type on decision making in natural resource management.
28 The results indicate a number of interesting trends which suggest possible
29 relationships that would be worthwhile investigating further. A variety of
30 future research questions arise from these results. For example, is a
31 Perceiving or Judging preference more likely to lead to adopting a
32 potentially risky new idea? How might a Stabilizer act differently than a
33 Theorizer in this regard? How might personality type link to factors such as
34 goals that an individual may hold, or the communication channels they are
35 most attuned to? Is Thinking versus Feeling correlated with particular
36 attitudes toward natural resources? Similarly, given the differences across
37 scales, how might these differences affect cross-scale interactions? Does
38 having Theorizers at the national and state level, while having Stabilizers at
39 the local and regional level, suggest different interactions than the opposite,
40 or if the predominant type was similar across scales?
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3 Finally, we suggest that, in order to increase participation in sustainable
4 natural resource practices greater attention must be paid to individual and
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6 human differences and the implication this has on the relationship between
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8 the individual, participation and collective action.
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12 13 **Acknowledgements**

14
15 We wish to thank Land & Water Australia for the funding to undertake this
16
17 research. We acknowledge and are most grateful to all those people whose
18
19 chose to take part in our survey. Special thanks to Dr Ann Hamblin and Dr
20
21 Anne Russell for their constructive comments on earlier drafts and to this
22
23 journal's reviewers.
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Table 1 Contribution made by each preference to each of the 16 Myers-Briggs Types
(based on Myers and others (1998))

		Sensing		Intuitive	
		With thinking	With feeling	With thinking	With feeling
Introvert	With judging	ISTJ	ISFJ	INFJ	INTJ
	With perceiving	ISTP	ISFP	INFP	INTP
Extrovert	With perceiving	ESTP	ESFP	ENFP	ENTP
	With judging	ESTJ	ESFJ	ENFJ	ENTJ

I = depth of concentration

S = reliance on facts

T = logic and analysis

J = organisation

E = breadth of interests

N = grasp of possibilities

F = warmth and sympathy

P = adaptability

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Table 2 The Temperament Matrix and the descriptions of the temperaments
(Berens 2006)

<u>INFJ</u>	<u>INFP</u>	<u>ISTJ</u>	<u>ISFJ</u>
Catalyst		Stabilizer	
<u>ENEJ</u>	<u>ENFP</u>	<u>ESTJ</u>	<u>ESFJ</u>
<u>INTJ</u>	<u>INTP</u>	<u>ISTP</u>	<u>ISFP</u>
Theorist		Improviser	
<u>ENTJ</u>	<u>ENTP</u>	<u>ESTP</u>	<u>ESFP</u>

Improviser™

To improvise is to vary one's actions to get the best result using whatever is at hand. It is the ultimate expression of the freedom to respond to the needs of the moment. It is also the means to create pleasant aesthetic experiences.

Stabilizer™

Stabilizing prevents groups and institutions falling apart. It is fundamental to creating an environment where one can be secure in a sense of belonging. It provides the means to economic security.

Theorist™

Understanding and developing theories provides the basis for mastery and competence. Businesses are built on scientific discoveries and innovations. Theory is the means to understanding the objective truth on which to build a path to achievement.

Catalyst™

To catalyse is to engage with others in a way that promotes their identify without losing one's own identity. Catalyzing is natural to those who need to have a meaning and purpose to their lives. It is the means to self-actualization.

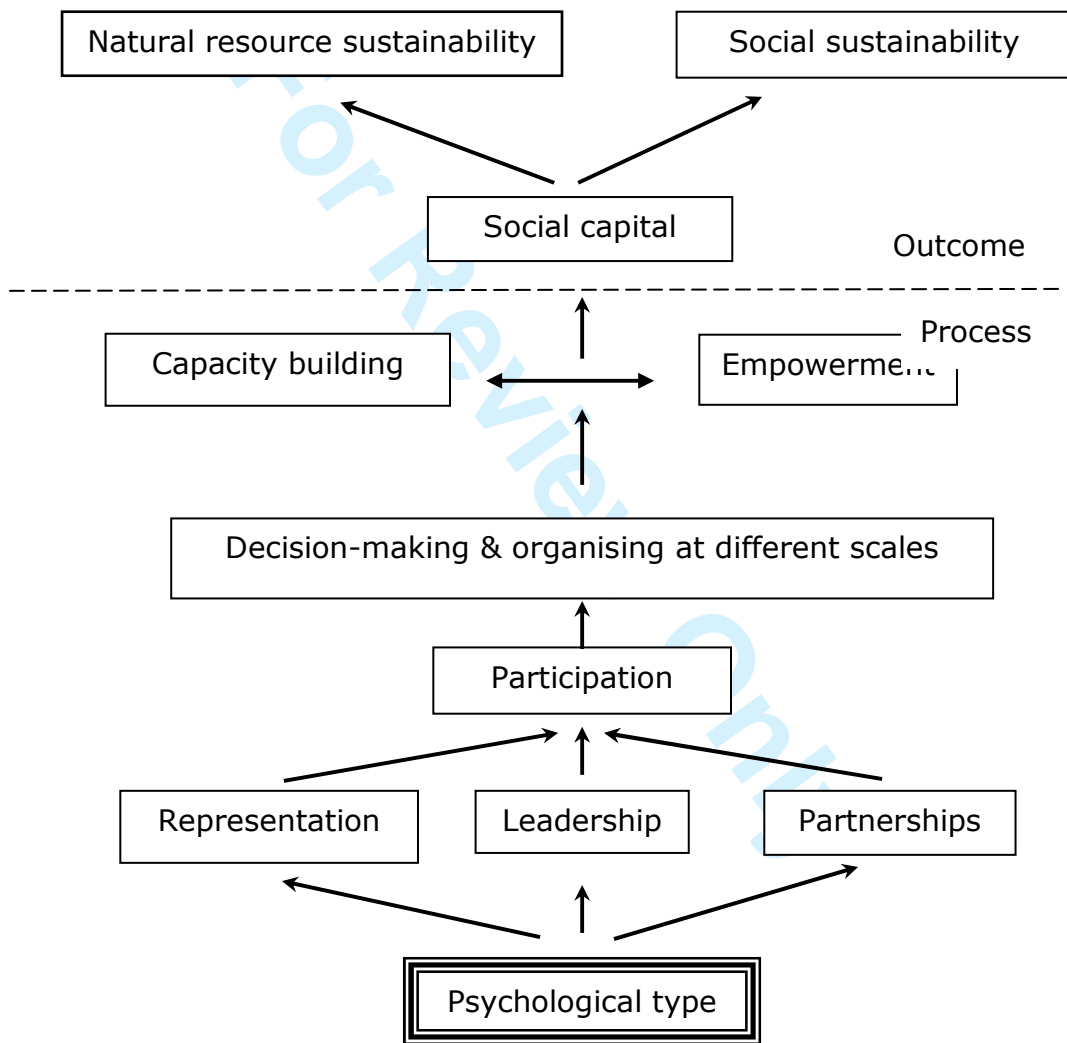
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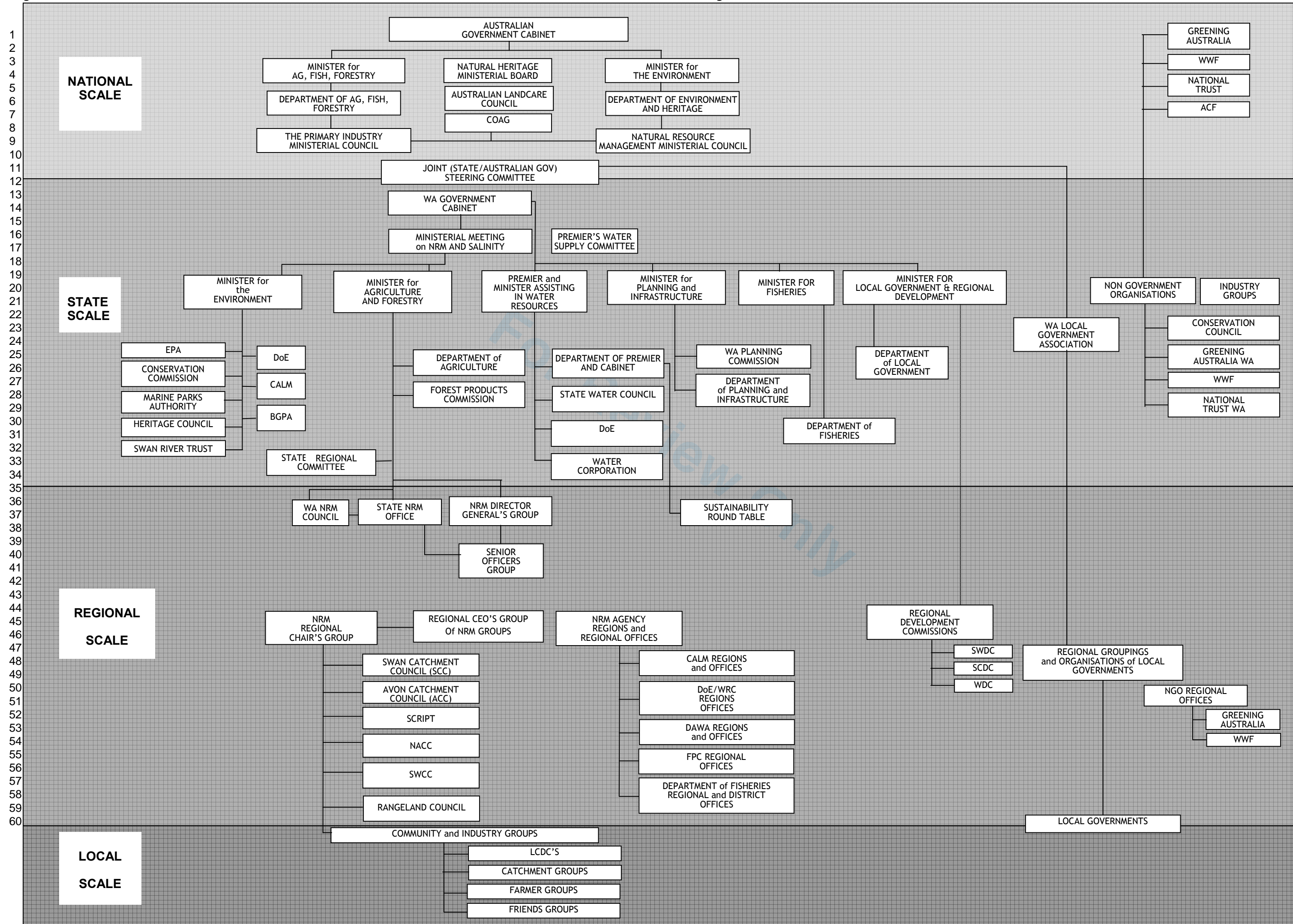
Table 3 Numbers of types in the decision makers in natural resource management

ISTJ 13	ISFJ 2	INFJ 3	INTJ 12
ISTP 4	ISFP 2	INFP 4	INTP 6
ESTP 2	ESFP 2	ENFP 17	ENTP 14
ESTJ 12	ESFJ 3	ENFJ 7	ENTJ 18

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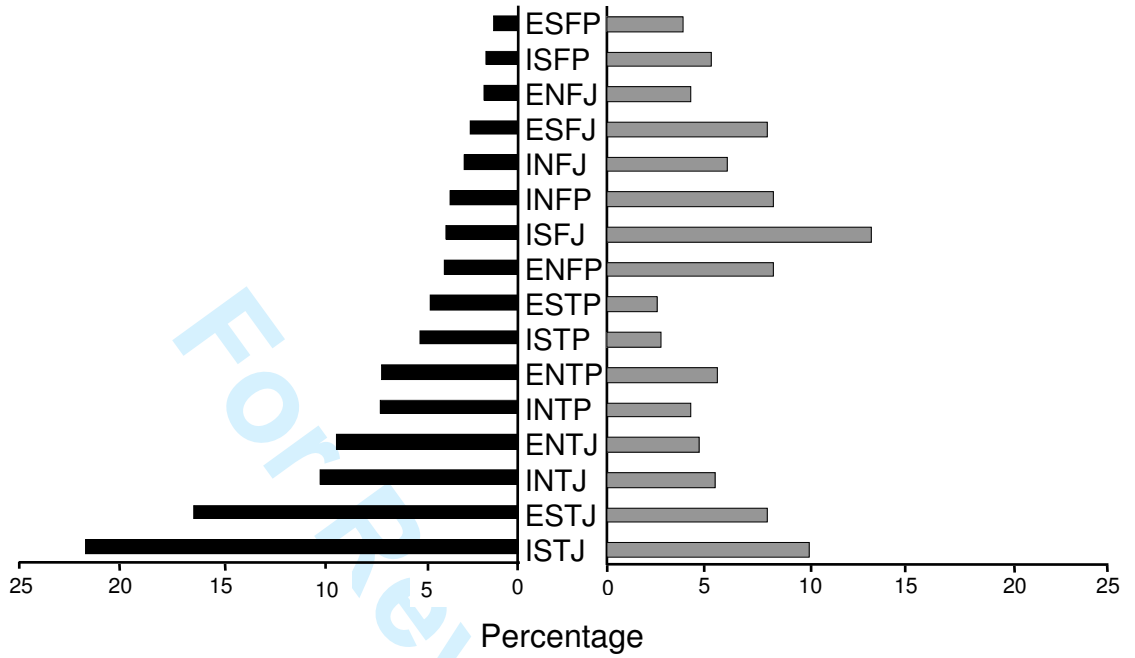




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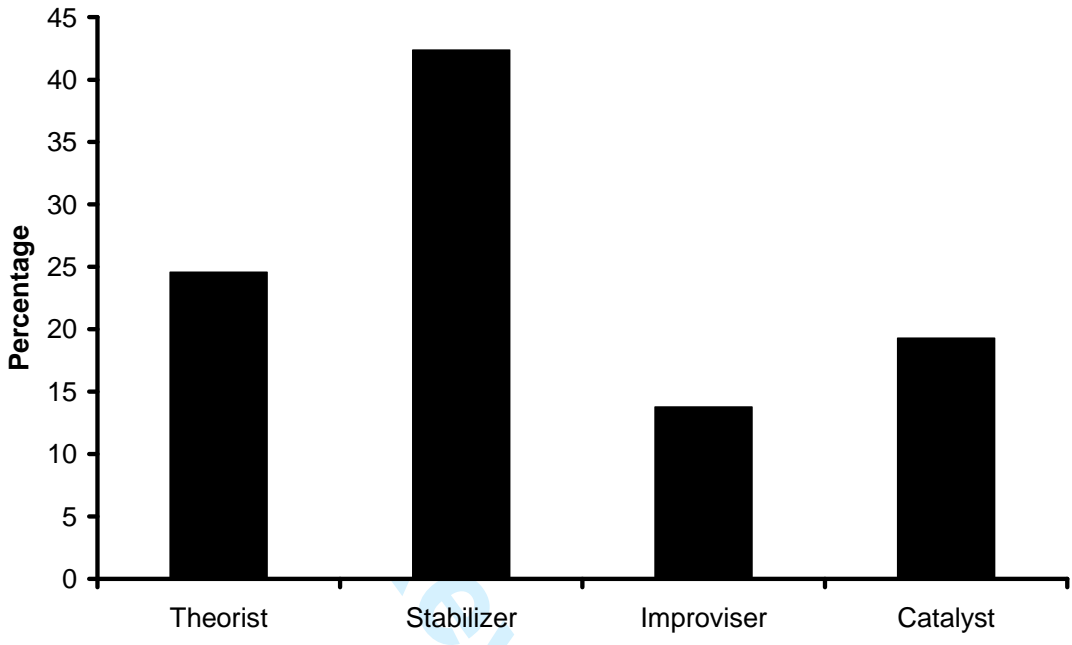
Males n = 7569

Females n =6507



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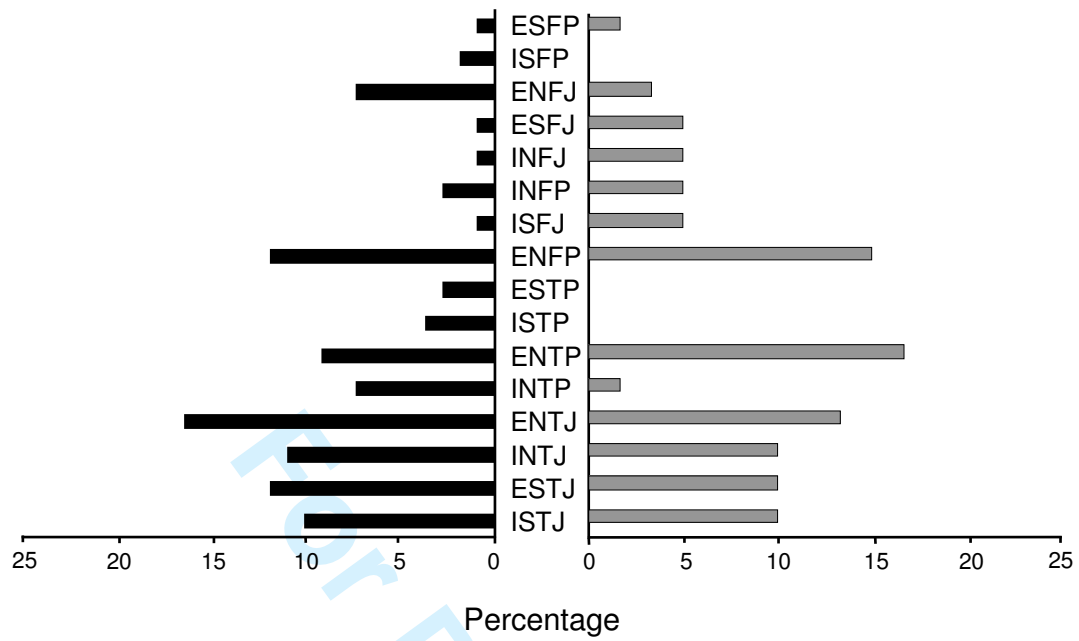


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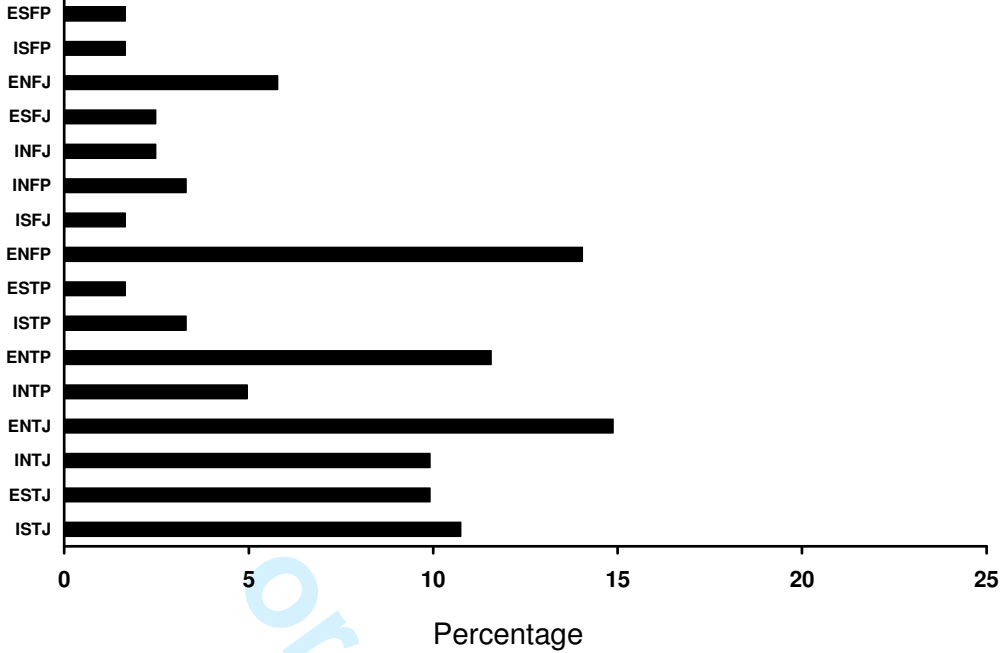
Males n = 107

Females n = 52



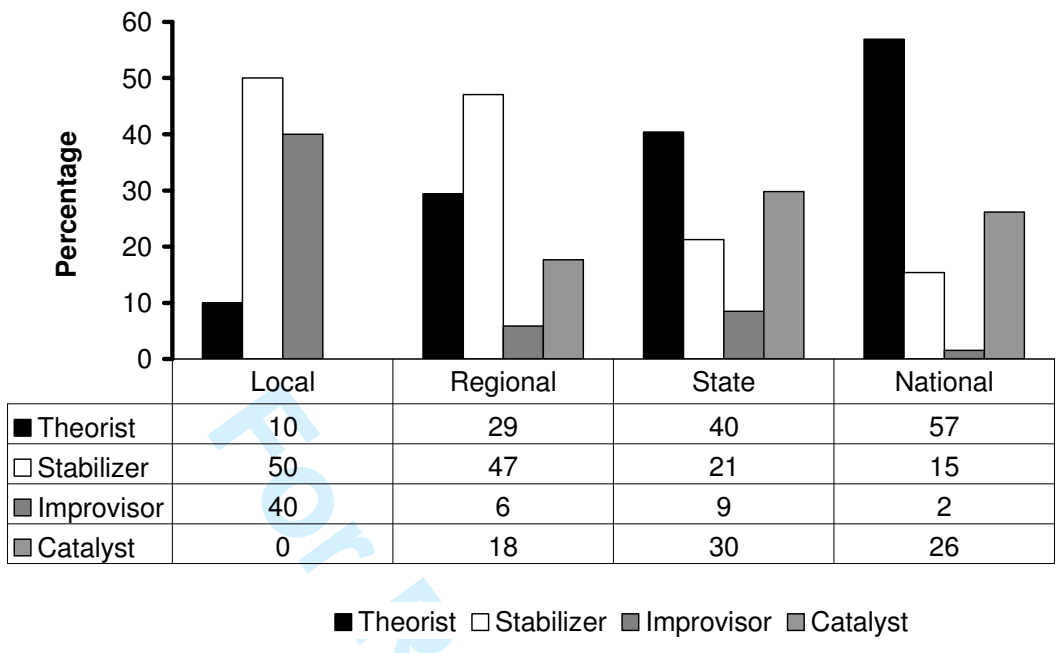
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