Datazone level Namibian Index of Multiple Deprivation 2001

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National Report

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PREFACE

This report is the result of collaborative work between the Government of the Republic of Namibia (GRN), the United Nations Development Programme (UNDP) and the Centre for the Analysis of South African Social Policy at the Oxford Institute of Social Policy at the University of Oxford.

In November 2009, the Khomas Regional Council requested UNDP to assist in designing an objective criterion or set of criteria, devoid of political and other considerations, which the Council could use in allocating development resources. Subsequent discussions led to an agreement that other stakeholders, especially the Central Bureau of Statistics needed to be involved and that the criterion or set of criteria needed to go beyond income poverty considerations. It was also agreed that rather than focus on Khomas region alone, the criterion or set of criteria needed to be applicable to, or cover the entire country. Specifically, it was agreed that a composite index of multiple deprivation, the Namibia Index of Multiple Deprivation (NIMD), be constructed at both national and regional levels. Since the scope and depth of analysis needed for the development of the NIMD required very detailed and reliable data and information, it was agreed that the 2001 census data, though 'outdated', be used as the source of information for preparing the NIMD. Accordingly, the NIMD being presented in this report reflects the situation at the 2001 time-point only. UNDP and the GRN recognize that the report does not speak to possible changes in relative deprivation that may have occurred since 2001. Nevertheless the 2001 NIMD could serve as a benchmark against which change over the last decade could be measured when the 2011 Census becomes available and is subsequently used for carrying out a similar analysis.

The report presents, using tables, charts and digital maps, a profile of multiple deprivation in Namibia at data zone level, which is a relatively new statistical geography developed for purposes of measuring deprivation at a small area level. This technique of profiling deprivation at datazone level, each with approximately 1000 people only, enables the identification and targeting of pockets of deprivation within regions and constituencies (sub-regional level) for possible development interventions. The aim of the exercise was to produce a profile of relative deprivation across Namibia in order for the most deprived areas to be identified and clearly delineated. In this way, it would be possible for policy and decision makers, as well development practitioners, to consider a particular domain of deprivation, or to refer to the overarching NIMD, which is a weighted combination of all the six domains, in *inter alia*, allocating and applying development resources and interventions. The NIMD can also be used as a platform for possible paradigm shift in development planning to increased focus on and targeting of deprived areas and sectors; as well as for interrogating the causes of inequality in access to basic services. The NIMD at datazone level, as presented in this report, should be viewed as adding to the existing body

of information and knowledge, including local knowledge systems, about poverty and deprivation in Namibia and the large family of existing planning and resource allocation tools and methodologies already in use at both national and sub-national levels.

This project was undertaken by Professor Michael Noble, Dr Gemma Wright, Ms Joanna Davies, Dr Helen Barnes and Dr Phakama Ntshongwana of the Centre for the Analysis of South African Social Policy at the Oxford Institute of Social Policy at the University of Oxford, under the leadership and guidance of a national steering committee chaired by Mr Sylvester Mbangu, Director of the Central Bureau of Statistics. In addition to providing the funds for carrying out the project and serving on the steering committee, UNDP provided overall oversight and technical backstopping to the project through Ojijo Odhiambo, Senior Economist and Johannes Ashipala, National Economist. David Avenell is thanked for his assistance with producing the datazones.

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EXECUTIVE SUMMARY

This report presents a profile of multiple deprivation in Namibia. The analysis is based on data from the 2001 Population Census and is presented at datazone level. Datazones are a new statistical geography developed for purposes of measuring and profiling deprivation at a small area level thus enabling pockets of deprivation to be identified.

A Namibian Index of Multiple Deprivation (NIMD) at datazone level was constructed comprising five dimensions or 'domains' of deprivation: material deprivation, employment deprivation, health deprivation, education deprivation, and living environment deprivation (the process of constructing datazones is detailed in Section 2). Each domain measures the extent of deprivation at an area level for each datazone across Namibia. The domains and indicators included in the datazone level NIMD were selected in consultation with members of Khomas Regional Council and the Central Bureau of Statistics, and subsequently validated by representatives of the thirteen Regional Councils at workshop held in Ondangwa in November 2011.

The aim was to produce a profile of relative deprivation across Namibia in order for the most deprived areas to be identified (the domains, and the indicators that make up each domain, as well the methodological techniques that were used in the construction of the domains and the NIMD are described in Section 3). In this way, it would be possible for policy and decision makers, as well development practitioners, to consider a particular domain of deprivation, or to refer to the overarching NIMD, which is a weighted combination of all the six domains, in *inter alia*, allocating and applying development resources and interventions. The NIMD can also be used as a platform for possible paradigm shift in development planning to increased focus on and targeting of deprived areas and sectors; as well as interrogating the causes of inequality in access to basic services.

A number of tables, charts and maps of Namibia profiling spatial distribution of the multiple deprivation, as well as each of the five domains of deprivation at datazone level are presented. If all the datazones are compared alongside one another, the most deprived datazone in Namibia, using the NIMD 2001, is located in Ndiyona constituency (Kavango Region), while the least deprived datazone in Namibia, using the NIMD 2001, is in Windhoek East (Khomas Region). Although the pattern of deprivation is different for each domain, a common trend is that the majority of the most deprived datazones on each domain, on the basis of the 2001 census data, are located in the north of Namibia. The NIMD 2001 is a useful tool for profiling deprivation across the country, alongside other sources of information and local knowledge. Though it relates to a 2001 time point, it serves as a benchmark against which change can be measured when the 2011 Census is released and similar analysis carried out.

SECTION 1: INTRODUCTION

The Namibian Index of Multiple Deprivation 2001 (NIMD 2001) is a composite index reflecting five dimensions of deprivation: income and material deprivation; employment deprivation; education deprivation; health deprivation; and living environment deprivation.

The Namibian Index of Multiple Deprivation 2001 (NIMD 2001) is a composite index reflecting five dimensions of deprivation: income and material deprivation; employment deprivation; education deprivation; health deprivation; and living environment deprivation. The NIMD and the component domains of deprivation were produced at datazone level using data from the 2001 Population Census. As will be elaborated in Section 2, datazones are small areas containing approximately the same number of people (average 1,000). The datazone level NIMD therefore provides a fine-grained picture of deprivation in Namibia and enables pockets of deprivation to be identified.

The report is structured as follows: The background information and the conceptual framework which underpins the model of multiple deprivation is described in this introductory section. In Section 2 the rationale for and process of constructing datazones are described. Section 3 introduces the domains and indicators that were included in the NIMD and summarises the methodological approach that was used in constructing the NIMD. In Section 4 datazone level results across Namibia are presented, while conclusions and some policy recommendations are presented in Section 5.

1.1 Background

Initially a NIMD was created at constituency level for the Khomas Regional Council, but applicable to other regions of the country, using data from the 2001 Population Census at constituency level after a two-day consultative process on the domains and indicators with members of the Namibian Central Bureau of Statistics and civil servants from the Council. The objective of this phase of the project was to construct measures of multiple deprivation at constituency level in order to provide a more detailed analysis of deprivation which would enable Khomas Regional Council and other regional councils across Namibia to rank their areas in order of deprivation, and also to set them in the context of all other areas in Namibia.

“The NIMD and the component domains of deprivation were produced at datazone level using data from the 2001 Population Census. As will be elaborated in Section 2, datazones are small areas containing approximately the same number of people (average 1,000)”

The datazone level index presented in this report draws from the previous constituency index, although, in the process of producing the datazone level index, it became necessary to make some small changes to some of the domains and indicators. As such, the constituency level index has also been revised to give a comparable measure. The results of this work at the datazone level were presented to, and validated by, representatives of all the 13 Regional Councils at a workshop held in Ondangwa in Novemver 2011.

1.2 Defining poverty and deprivation

Townsend (1979) sets out the case for defining poverty in terms of relative deprivation as follows: *'Individuals, families and groups can be said to be in poverty if they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary or at least widely encouraged or approved in the societies to which they belong'* (Townsend, 1979, p31).

Though 'poverty' and 'deprivation' have often been used interchangeably, many have argued that a clear distinction should be made between them (see for example the discussion in Nolan and Whelan, 1996). Based on this line of thought, it can be argued that the condition of poverty means not having enough financial resources to meet a need, whereas deprivation refers to an unmet need, which is caused by a lack of resources of all kinds, not just financial. In his article 'Deprivation' Townsend also lays down the foundation for articulating multiple deprivation as an aggregation of several types of deprivation (Townsend, 1987). Townsend's formulation of multiple deprivation is the starting point for the model of small area deprivation which is presented here.

1.3 The concept of multiple deprivation

The starting point for the NIMD is a conceptual model of multiple deprivation. The model of multiple deprivation is underpinned by the idea that there exists separate dimensions of deprivation which can be recognised and measured, and are experienced by individuals living in an area. Multiple deprivation is therefore conceptualised as a weighted combination of distinct dimensions or domains of deprivation. An area level score for each domain is produced and these are then combined to form an overall Index of Multiple Deprivation.

Although the area itself is not deprived, it can nonetheless be characterised as deprived *relative* to other areas, in a particular dimension of deprivation, on the basis of the proportion of people in the area experiencing the type of deprivation in question. In other words, the experiences of the people in an area give the area its deprivation characteristics. It is important to emphasize the area itself is not deprived, though the presence of a concentration of people experiencing deprivation in an area may give rise to a compounding deprivation effect, but this is still measured by reference to those individuals. Having attributed the aggregate of individual experience of deprivation to the area however, it is possible to say that an area is deprived in that particular dimension. And having measured specific dimensions of deprivation, these can be understood as domains of multiple deprivation.

SECTION 2: DATAZONES

Datazones are a new statistical geography for Namibia created especially for this version of the NIMD 2001. This section provides a non-technical overview of the process of creating the datazones and summarises their characteristics.

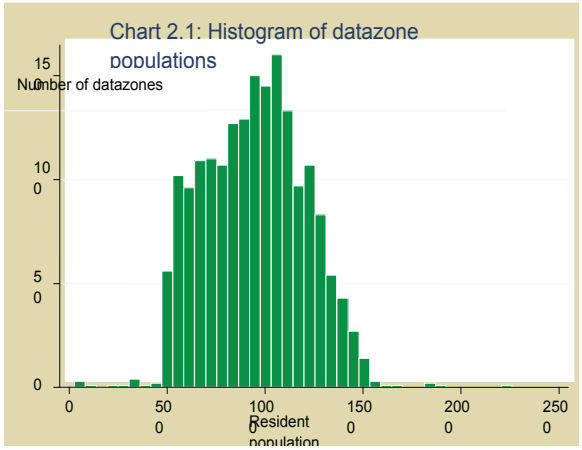
2.1 Methodology

The methodology adopted is based on a similar process undertaken in South Africa (Avenell et al., 2009) which in turn was adapted from techniques developed in the United Kingdom (see, for example, Martin et al., 2001).

Datazones were built up from Census Enumeration Areas (EAs) to create a standard uniform geography across Namibia based on the existing EA geography which nest within 2001 constituency boundaries, which in turn nest within regional boundaries. Though a datazone may be created from a single EA, it is usually created by merging one or more contiguous EAs which share common characteristics in accordance with a set of pre-defined rules. The actual creation of datazones was undertaken using a variety of geographical programming techniques (see Avenell et al., 2009). A set of rules governing the merging process was drawn up to ensure that the datazones had, as close as was possible, the following characteristics:

Population size: Datazones are designed to have a similar resident population size - this allows comparability across the whole country. The target population size was 1,000 with a minimum of 500 and maximum of 1,500. Inevitably the extent to which this target could be achieved was dependent on the variation in size and characteristics of the building block EAs. A total of 1,871 datazones were created with a mean population size of 946. Sixteen datazones had populations below 500 while 13 had populations exceeding 1,500.

The following chart illustrates the distribution of population across the datazones.



> "Though a datazone may be created from a single EA, it is usually created by merging one or more contiguous EAs which share common characteristics in accordance with a set of pre-defined rules."

Population density: Datazones should comprise EAs of similar population density. This is important to ensure that urban areas become distinct from rural areas. The datazone algorithm incorporated thresholds to ensure that, wherever possible, urban areas became tightly bounded.

Internal homogeneity: It is important that datazones comprise EAs of similar characteristics. This helps to ensure that the datazone geography created is 'meaningful' in that, for example, in urban areas housing of a similar type is grouped together within one datazone and that those living in EAs within a single datazone share similar socio-economic characteristics. In order to achieve this all EAs in Namibia were analysed using a technique known as cluster analysis. This technique groups EAs across the country into a small number of 'families' based on a variety of relevant characteristics. In the cluster analysis adopted in the development of the datazones, all EAs in Namibia were grouped into following five cluster types:

- Cluster type 1 comprises prosperous housing with high levels of brick construction, flush toilets, piped water, and phones, and low levels of candles for lighting or shacks.
- Cluster type 2 and cluster type 3 are quite similar in that houses within them have low levels of flush toilets, piped water and brick construction, but are not shacks. They are likely to be traditional dwellings in rural areas with walls of mud or straw. Also they have candles for lighting and differ from each other only on their access to telephones.
- Cluster type 4 is characterised by low levels of flush toilet and water supply but high levels of brick construction with few shacks.
- Cluster type 5 comprises mainly shacks in informal townships near large towns.

Rules were then developed which allowed EAs to merge with similar EAs in order to form datazones. A process of optimisation was undertaken whereby EAs were iteratively swapped between adjacent datazones to check if improvement occurred in terms of population density and/or optimal size. Some problems were however, insoluble due to the restrictions placed on datazone construction by the underlying EA geography. The datazones were checked and validated by obtaining aerial photography underlays for the mapping software and visually inspecting boundary positions.

"*Population density*: Datazones should comprise EAs of similar population density. This is important to ensure that urban areas become distinct from rural areas. The datazone algorithm incorporated thresholds to ensure that, wherever possible, urban areas became tightly bounded"

2.2 Regional distribution of datazones

The following table gives the number of datazones in each region together with the percentage of the total Namibian datazones in that region.

Table 2.1: Distribution of Namibian datazones across regions

Region	Number of datazones	Percentage of total datazones
Caprivi	84	4.49
Erongo	104	5.56
Hardap	75	4.01
Karas	68	3.63
Kavango	202	10.80
Khomas	252	13.47
Kunene	74	3.96
Ohangwena	233	12.45
Omaheke	81	4.33
Omusati	229	12.24
Oshana	167	8.93
Oshikoto	165	8.82
Otjozondjupa	137	7.32
Namibia	**1,871**	**100.00**

SECTION 3: METHODOLOGY

3.1 Data and geography

The NIMD was produced using the 2001 Namibian Population Census which was supplied by the Namibian Central Bureau of Statistics for the purposes of this project. Whilst the intention should always to be concept-led rather than 'data-driven', the project team was restricted to selecting indicators from the range of questions included within the Census. The NIMD was produced at datazone level (and also at constituency level on a comparable basis). There are 1,871 datazones in Namibia.

3.2 An introduction to the domains and indicators

Domains

The NIMD contains five domains of deprivation:

- Material Deprivation[1]
- Employment Deprivation
- Health Deprivation
- Education Deprivation
- Living Environment Deprivation

Following on from the definition of multiple deprivation outlined in Section 1, each domain is presented as a separate domain index reflecting a particular aspect of deprivation. Each domain seeks to measure only one dimension of deprivation, avoiding overlaps between the domains and providing a direct measure of the deprivation in question. Individuals can however, experience more than one type of deprivation at any given time and it is therefore conceivable that the same person can be captured in more than one domain. So, for example, if someone was unemployed, had no qualifications and had no access to basic material goods they would be captured in the Employment Deprivation, Education Deprivation and Material Deprivation domains.

These domains are similar to the domains used in a previous study in which the NIMD was constructed at constituency level. In the constituency level study the indicators were chosen following an extensive consultation process with representatives of the Central Bureau of Statistics, Khomas Regional Council and UNDP[2]. However, unlike the constituency level NIMD, it was necessary to make one change to the domains, namely to combine the Housing Deprivation and Services Deprivation Domains into a single Living

> "The NIMD was produced using the 2001 Namibian Population Census which was supplied by the Namibian Central Bureau of Statistics for the purposes of this project"

[1] This refers to material goods, that is, assets or possessions.

Environment Deprivation Domain in order to retain discriminating power at the datazone level. Furthermore, a detailed analysis at datazone level revealed that a separate Housing Deprivation Domain would carry with it a considerable urban bias as shacks and overcrowded dwellings are mainly found in urban areas. Combining housing indicators with service indicators to create a Living Environment Deprivation Domain, analogous to that used in indices in other countries, produced a measure that does not demonstrate any urban or rural bias.

Indicators

Each domain index contains a number of indicators. There are 11 indicators in total in the NIMD. The aim for each domain was to include a parsimonious (i.e. economical in number) collection of indicators that comprehensively captured the deprivation for each domain, but within the constraints of the data available from the 2001 Census. When identifying indicators for the domains, it was important to ensure that they are direct measures of the domain of deprivation in question and specific to that domain.

With the exception of changes to three indicators in the newly constituted Living Environment Deprivation Domain, the indicators are the same as those used in the previous constituency level index. As stated earlier, in the construction of that index the indicators were discussed at length during the consultation process and every effort was made to ensure that they were appropriate for the Namibian context. The domains need to allow different geographical areas to be distinguished from one another; therefore it would be unhelpful to identify a deprivation which is experienced by most people in most areas as this would not enable the areas to be ranked relative to each other in terms of deprivation. As will be elaborated below, this is the reason why it was necessary to make changes to certain indicators in the Living Environment Deprivation Domain.

"With the exception of changes to three indicators in the newly constituted Living Environment Deprivation Domain, the indicators are the same as those used in the previous constituency level index."

The model is designed to be updated in two ways: first, to allow for the re-evaluation of the number and nature of the dimensions of deprivation; second, to allow for new and more direct measures of those dimensions to be incorporated as data becomes available. In the following sub-sections the domains and indicators which make up the NIMD 2001 are described.

[2] During the consultation process a number of other domains were discussed. These included: access to recreation facilities, level of participation in community activities, crime, food security, provision of emergency services, and availability of affordable transport. Unfortunately data relating to these issues were not available within the Census. These issues could be incorporated into further iterations of the NIMD if appropriate administrative or geographical data becomes available.

3.3 Material Deprivation Domain

Purpose of the domain

The domain measures the proportion of the population experiencing material deprivation in an area by reference to the percentage of the population who are deprived of access to basic material possessions.

Background

In other indices that have followed this model (e.g. UK indices), an Income Deprivation Domain was created. However, there is an argument that such a domain is inappropriate within an Index of Multiple Deprivation, because - as explained above - deprivation can be regarded as the outcome of lack of income rather than the lack of income itself. To follow Townsend, within a multiple deprivation measure, only the deprivations resulting from a low income would be included so low income itself would not be a component, but lack of material possessions would be included. In any event, the 2001 Census did not have an income question and so an income poverty indicator, if included, would need to be modelled from a different data source such as the Namibian Household Income and Expenditure Survey. Such modelling work is being undertaken separately for the Central Bureau of Statistics (now Namibia Statistics Agency) by Lux Development and will provide a complementary small area measure of income poverty. For these reasons, a material deprivation domain was produced. A lack of access to basic material goods can be understood as a proxy for low income. The 2001 Census included questions about access to material goods (e.g. television, radio, newspaper, telephone and computer) which are internationally accepted and widely used as measures of variations in living standards.

Of the possible material goods that could be included as indicators, access to a television/radio and telephone/cell phone were selected as they represent important modes of communication and a means of accessing information crucial to one's life and livelihood. The quality of the services provided however, were not taken into account.

Indicators

- Number of people living in a household with no access to a television or a radio; or
- Number of people living in a household with no access to a telephone/cell phone.

Combining the indicators

A simple proportion of people living in households experiencing either one or both of the deprivations was calculated (i.e. the number of people living in a household with no access to a television/radio and/or with no access to a telephone/cell phone divided by the total population).

> "In any event, the 2001 Census did not have an income question and so an income poverty indicator, if included, would need to be modelled from a different data source such as the Namibian Household Income and Expenditure Survey"

3.4 Employment Deprivation Domain

Purpose of the domain

This domain measures employment deprivation conceptualised as involuntary exclusion of the working age population from the world of work by reference to the percentage of the working age population who are unemployed.

Background

The 2001 Census recorded employment status in line with the International Labour Organisation (ILO) 'labour force framework' and the 'priority rules' which give precedence to employment over all other activities *'regardless of the amount of time devoted to it, which in extreme cases may be only one hour'* (Hussmanns, 2007, p6). Therefore a person was considered to be employed if during the seven days prior to the Census night they worked for at least one hour for pay, profit or family gain. It follows that unemployment was defined as a situation of a total lack of work. The definition of unemployment adopted by the 13th International Conference of Labour Statistics (ICLS) stipulates three criteria which must be simultaneously met for a person to be considered unemployed. According to this official definition, the unemployed are those persons within the economically active population (aged 15-65 inclusive) who during the reference period (for the 2001 Census this is the seven days prior to Census night) were:

1. Without work, i.e. in a situation of total lack of work; and
2. Currently available for work, i.e. not a student or homemaker or otherwise unavailable for work; and
3. Seeking work, i.e. taking steps to seek employment or self-employment.

Using the 2001 Census however, it was not possible to measure whether unemployed people were available for work and seeking work. Though other indices have also included people of working age who cannot work because of illness or disability, as they are involuntarily excluded from the world of work and internationally are regarded as the 'hidden unemployed' (Beatty et al., 2000), the consultation group wanted to limit this domain to the economically active population and therefore disabled or long-term sick people were not included. The age band was modified to 15-59 inclusive to reflect a concept of working age relevant to Namibia.

Indicator

- Number of people aged 15-59 inclusive who are unemployed.

Combining the indicators

The domain was calculated as those identified as unemployed and aged 15 to 59 inclusive divided by the number of people who are economically active in that age group.

3.5 Health Deprivation Domain

Purpose of the domain

This domain identifies areas with relatively high rates of people who die prematurely. The domain measures premature mortality but not aspects of behaviour or environment that may be predictive of *forthcoming* health deprivation.

Background

Although the consultation process raised the importance of measuring people's health status, and access to health facilities and healthcare, these issues could not be measured using the 2001 Census data. It was therefore not possible to include any measures of morbidity or access to health

services. Instead a form of standardised mortality ratio known as Years of Potential Life Lost (YPLL) was used. An internationally recognised measure of poor health, the YPLL measure is the level of unexpected mortality weighted by the age of the individual who has died (for details about how this indicator was constructed see Blane and Drever, 1998). An area with a relatively high death rate in a young age group (including areas with high levels of infant mortality) will therefore *ceteris paribus*, have a higher overall YPLL score than an area with a similarly relatively high death rate for an older age group.

The YPLL indicator is a directly age and gender standardised measure of premature death (i.e. death under the age of 75)[3]. The YPLL measure is related to life expectancy in an area. Areas with low life expectancy will have high YPLL scores. Equally high levels of infant mortality and perinatal mortality as well as high levels of serious illness such as HIV/AIDS and tuberculosis will all contribute to reduced life expectancy in an area and therefore high YPLL scores. Thus, although the YPLL is a mortality measure, it does reflect the extent of serious ill-health in an area. And although it would have been possible to have used infant mortality, under-five mortality, and life expectancy as indicators, YPLL in effect combines all these issues into a single indicator and is therefore a broader and more useful overview of health deprivation in an area.

Indicator

- Years of potential life lost

"The YPLL measure is related to life expectancy in an area. Areas with low life expectancy will have high YPLL scores"

3.6 Education Deprivation Domain

Purpose of the domain

This domain measures deprivation in educational attainment for people aged 15 to 59 inclusive.

Background

Elsewhere in the Southern Africa Development Community (SADC) region it has been shown that the level of educational attainment in the working age adult population is closely linked to an individual's employment status and future opportunities for those individuals and their dependants (Bhorat et al., 2004).

The 2001 Census includes a record of the level of education completed and a record of illiteracy. These two questions provide the best available measures of educational attainment and make up the indicators for this domain. The consultation process additionally raised the importance of affordable education and availability of tertiary education opportunities, but again, these could not be adequately captured using the Census.

3. Because the direct method of standardisation makes use of individual age/gender death rates it is often associated with small numbers. An empirical Bayes or 'shrinkage' technique is therefore used to smooth the individual age/gender death rates in order to reduce the impact of small number problems on the YPLL.

Indicators

- Number of 15-59 year olds inclusive with no schooling completed at secondary level or above; or
- Number of 15-59 year olds inclusive who are illiterate.

Combining the indicators

A simple proportion of the working age population (aged 15 to 59 years old inclusive) who had not completed schooling at secondary level or who are illiterate was calculated (i.e. the number of people with no schooling completed at secondary level or above or who are illiterate divided by the population aged 15 to 59 inclusive).

3.7 Living Environment Deprivation Domain

Purpose of the domain

This domain measures both inadequacy in housing conditions and a lack of basic services to the home.

Background

The 2001 Census questionnaire provides indicators on households' access to basic amenities. These aspects of the immediate environment in which people live impact on the quality of their life and provide good measures of deprivation in terms of access to services.

Measuring access to electricity as a basic amenity is a useful indicator of living environment deprivation. Three Census indicators were considered: main source of energy for cooking, lighting and heating. Although cost, availability and effectiveness are factors in the consumption of all energy supplies, it has been argued that in certain instances, the choice of fuel for cooking may be influenced by cultural preference rather than availability alone, whereas the use of electricity for lighting would generally be the preferred choice if available and therefore provides a more valid measure of deprivation in terms of access to energy for lighting (Bhorat et al., 2004). This was the measure used in the previous constituency level index. However, at datazone level, all individuals in a high proportion of datazones were found to lack electricity for lighting. The datazones would all be given the same overall score for this domain, and so it would not be possible to discriminate between datazones in terms of their level of deprivation. For this reason the indicator was altered slightly to include paraffin alongside electricity (and solar power) as the measure of access to energy for lighting. The inclusion of paraffin however, does not imply any judgement about its suitability for lighting purposes, but is rather a means of enabling datazones to be properly ranked on this domain.

Access to clean drinking water and sanitation facilities is essential for the good health of the population and thus an important indicator to include in this domain. An indicator of no access to piped water within the home or within 200 metres

> "Access to clean drinking water and sanitation facilities is essential for the good health of the population and thus an important indicator to include in this domain"

of the home was included. The threshold of 200 metres was regarded by the consultation group as preferable to a threshold of 400 metres (the MDG measure). Though in the previous (constituency) index people without flush toilets or ventilated pit latrines were regarded as deprived, investigation of this indicator at datazone level revealed that again, a high proportion of datazones scored 100 percent. Therefore, as with the access to energy indicator, an additional criterion was added: long drop pit latrines were included alongside flush toilets and ventilated pit latrines. Again, the inclusion of long drop pit latrines does not imply adequacy, but is included simply as a means of discriminating between datazones.

The quality of housing construction provides an important indicator for the quality of day-to-day life and vulnerability to shocks such as adverse weather conditions (Bhorat et al., 2004; Programme of Action Chapter 2 World Summit for Social Development Copenhagen 1995). There was much discussion in the consultation process about traditional dwellings and their adequacy. Though the 2001 Census contains fairly precise information about materials used in the construction process, there is no way of identifying whether the resultant buildings were of a high quality or not; it was therefore agreed that only shacks could be reliably identified as inadequate. The crowding indicator is calculated by dividing the number of people in the household by the number of rooms excluding bathrooms, toilets, kitchens, stoops and verandas. Different versions of the crowding indicator were considered. It was felt that the most appropriate measure of crowding was to classify three or more people per room as a deprivation. Setting the capacity cut-off at two or more people per room was considered. However, it was felt that this lower capacity would capture too many non-deprived people, for example relatively well-off couples sharing a one room urban apartment. An indicator relating to refuse collection services was included in the previous constituency level index, but was not sufficiently discriminatory at datazone level and so had to be dropped. The following table shows the analysis carried out on the indicators which led to the decision to change (from the constituency level analysis) two indicators and drop the refuse collection indicator. Different versions of the Living Environment Deprivation Domain are listed alongside the percentage of datazones where 100 percent of the population was classified as deprived.

Table 3.1: Analysis on the indicators in the Living Environment Deprivation Domain

Version of Living Environment Deprivation Domain	Percentage of datazones with 100% of population classified as deprived
1. Original constituency level index indicators	58
2. Version 1 with modified electricity indicator	55
3. Version 1 with modified toilet indicator	57
4. Version 1 with refuse collection indicator dropped	43
5. Version 4 with modified electricity indicator	31
6. Version 4 with modified toilet indicator	36
7. Version 4 with modified electricity and toilet indicators (the final version)	20

Indicators

- Number of people living in a household without the use of electricity, paraffin or solar power for lighting; or
- Number of people living in a household without access to a flush toilet or pit latrine (ventilated or long drop); or
- Number of people living in a household without piped water/borehole/borehole with covered tank (but not open tank)/protected well inside their dwelling or yard or within 200 metres; or
- Number of people living in a household that is a shack; or
- Number of people living in a household with three or more people per room.

Combining the indicators

A simple proportion of people living in households experiencing one or more of the deprivations was calculated (i.e. the number of people living in a household without electricity, paraffin or solar power for lighting and/or without adequate toilet facilities and/or without adequate water provision and/or living in a shack and/or in overcrowded conditions divided by the total population).

3.8 Constructing the domain indices

In all domains apart from the Health Deprivation Domain, the overall score is a simple proportion of the relevant population, and so can be easily interpreted.

As Censuses can be regarded as a sample from a super-population, it is important to consider and deal with large standard errors. A technique that takes standard errors into account but still enables one to then combine the domains into an overall index of multiple deprivation is called Bayesian shrinkage estimation. Specifically, the scores for datazones can be unreliable when the deprived population is small and so the shrinkage technique was applied to each of the domains. The 'shrunk' estimate is the weighted average of the original datazone level estimate and an appropriate larger spatial unit. The weight is based on the standard error of the original datazone estimate and the amount of variation within the constituency. For further details about this technique see Annex 2 and also Noble et al. (2006b).

"As Censuses can be regarded as a sample from a super-population, it is important to consider and deal with large standard errors. A technique that takes standard errors into account but still enables one to then combine the domains into an overall index of multiple deprivation is called Bayesian shrinkage estimation"

3.9 Standardising and transforming the domain indices

Having obtained a set of domain indices these needed to be combined into an overall Namibia Index of Multiple Deprivation and in order to combine domain indices which are each based on different metrics there needed to be some way to standardise the scores before any combination could take place. A form of standardisation and transformation is required that meets the following criteria. First it must ensure that each domain has a common distribution; second, it must not be scale dependent (i.e. conflate size with level of deprivation); third, it must have an appropriate degree of cancellation built into it; and fourth, it must facilitate the identification of the most deprived datazones. The exponential transformation of the ranks best meets these criteria and was applied in the NIMD 2001. For further details see Annex 3 and Noble et al. (2006b).

3.10 Weights for the domain indices when combining into an overall Index of Multiple Deprivation

Domains are conceived as independent dimensions of multiple deprivation, each with their own additive impact on multiple deprivation. The strength of this impact, though, may vary between domains depending on their relative importance. As a starting point, equal weights for the domains were recommended and this was supported by the consultation group. Each domain was therefore assigned a weight of 1. The NIMD was therefore constructed by adding the standardised and transformed domain indices with equal weights.

"A form of standardisation and transformation is required that meets the following criteria. First it must ensure that each domain has a common distribution; second, it must not be scale dependent (i.e. conflate size with level of deprivation); third, it must have an appropriate degree of cancellation built into it; and fourth, it must facilitate the identification of the most deprived datazones. The exponential transformation of the ranks best meets these criteria and was applied in the NIMD 2001. For further details see Annex 3 and Noble et al. (2006b)"

SECTION 4: FINDINGS - NAMIBIA

4.1 Multiple deprivation

This subsection presents multiple deprivation at datazone level. The overall NIMD at datazone level is presented and summarised at regional and constituency levels. Detailed analyses at regional and constituency levels are however, presented in the accompanying 13 regional reports.

Tables 4.1 and 4.2 list the 20 most deprived and 20 least deprived datazones in Namibia, respectively, showing their score on the NIMD and national rank (where 1=most deprived and 1,871=least deprived) on the basis of data from the 2001 census. The most deprived datazone in Namibia is located in Ndiyona constituency in Kavango Region. Two other Ndiyona datazones and five other datazones from the Kavango Region (four in Mukwe constituency and one in Mashare constituency) are in the most deprived 20 on this overall measure of multiple deprivation. Other regions that feature prominently are Ohangwena (five datazones), Omusati (four datazones), Oshikoto (two datazones) and Caprivi (one datazone).

Table 4.1: The 20 most deprived datazones on the NIMD 2001

Datazone	Constituency	Region	NIMD score	NIMD rank
482	Ndiyona	Kavango	387.4	1
481	Ndiyona	Kavango	364.3	2
1268	Okahao	Omusati	360.3	3
455	Mukwe	Kavango	360.1	4
1085	Omulonga	Ohangwena	358.4	5
1644	Omuntele	Oshikoto	352.2	6
1093	Omulonga	Ohangwena	349.9	7
1080	Omulonga	Ohangwena	348.6	8
1053	Oshikango	Ohangwena	346.5	9
1273	Okahao	Omusati	345.7	10
1275	Okahao	Omusati	345.6	11
469	Mukwe	Kavango	344.6	12
459	Mukwe	Kavango	343.8	13
460	Mukwe	Kavango	343.2	14
74	Linyanti	Caprivi	340.5	15
480	Ndiyona	Kavango	339.9	16
1616	Okankolo	Oshikoto	339.3	17
411	Mashare	Kavango	338.2	18
1384	Tsandi	Omusati	334.7	19
1002	Omundaungilo	Ohangwena	334.1	20

Analysis of the percentage of each constituency's datazones that are in the most deprived 10 percent of datazones nationally on the overall NIMD shows that:

- There are 18 constituencies where a quarter or more of the datazones are in the most deprived 10 percent nationally. These constituencies are located in six regions: Caprivi, Kavango, Kunene, Ohangwena, Omusati and Oshikoto.
- Of these, there are three constituencies where half or more of the datazones are in the most deprived 10 percent nationally. These constituencies are: Epupa in Kunene, Okahao in Omusati Region and Omulonga in Ohangwena Region.

At the other end of the scale, the least deprived datazone is in Windhoek East constituency in Khomas Region. Of the 20 least deprived datazones, 15 are in the Khomas Region: nine are in Windhoek East, four are in Windhoek West and two are in Windhoek Rural constituencies. The remaining datazones in the list of the 20 least deprived datazones are in Erongo (four datazones) and Karas (one datazone) regions.

Table 4.2: The 20 least deprived datazones on the NIMD 2001

Datazone	Constituency	Region	NIMD score	NIMD rank
709	Windhoek East	Khomas	4.9	1871
702	Windhoek East	Khomas	5.0	1870
700	Windhoek East	Khomas	6.2	1869
694	Windhoek East	Khomas	6.7	1868
692	Windhoek East	Khomas	6.8	1867
693	Windhoek East	Khomas	6.9	1866
710	Windhoek Rural	Khomas	8.2	1865
695	Windhoek East	Khomas	9.8	1864
754	Windhoek West	Khomas	10.9	1863
339	Oranjemund	Karas	10.9	1862
198	Walvis Bay Urban	Erongo	11.0	1861
708	Windhoek East	Khomas	11.1	1860
148	Swakopmund	Erongo	11.2	1859
704	Windhoek East	Khomas	11.4	1858
129	Swakopmund	Erongo	11.5	1857
183	Walvis Bay Urban	Erongo	12.3	1856
711	Windhoek Rural	Khomas	12.4	1855
767	Windhoek West	Khomas	12.7	1854
768	Windhoek West	Khomas	13.2	1853
760	Windhoek West	Khomas	13.5	1852

Analysis of the percentage of each constituency's datazones that are in the least deprived 10 percent nationally on the overall NIMD shows that:

- In eleven constituencies a quarter or more of the datazones are in the least deprived 10 percent nationally. These are located in five regions: Erongo, Hardap, Karas, Khomas and Oshana.
- Of these there are five constituencies where half or more of the datazones are in the least deprived 10 percent nationally: three are in the Khomas region, one is in Hardap region and one in Karas region.
- In three of the five constituencies (Windhoek East, Windhoek West and Oranjemund), three quarters or more of the datazones in are in the least deprived 10 percent.
- In Windhoek East and Windhoek West constituencies all of the datazones are in the least deprived 10 percent.

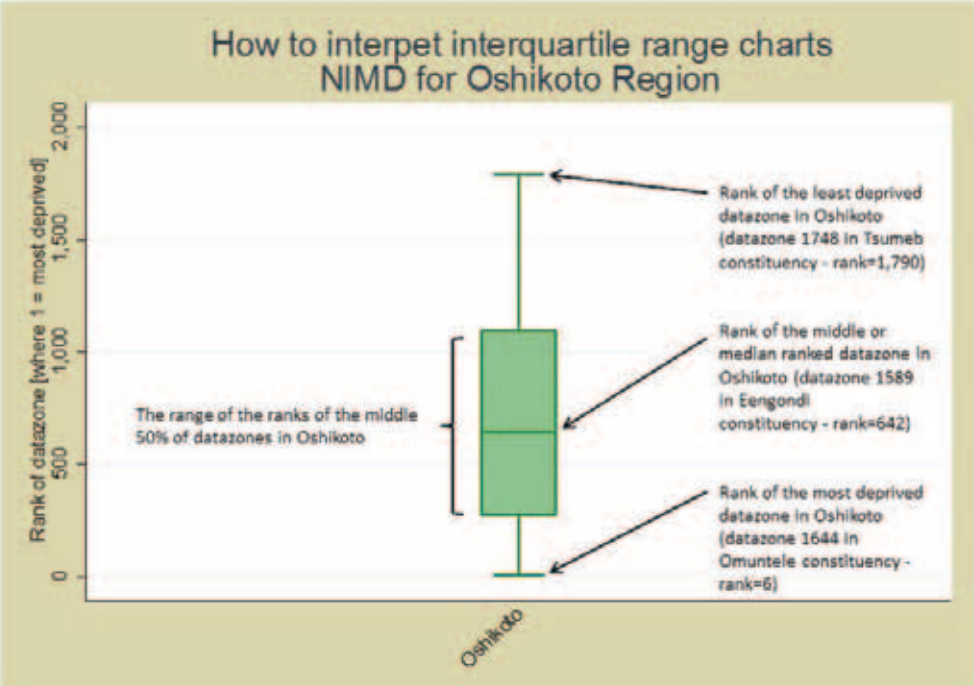
Table 4.3 shows the percentage of each region's datazones that are in the most deprived 10 percent and 20 percent of datazones nationally on the overall NIMD. Almost one quarter of Ohangwena's datazones and over one fifth of Kavango's datazones are in the most deprived 10 percent nationally. These two regions also have a very similar percentage of datazones in the most deprived 20 percent nationally, at 41.1 percent and 41.2 percent, respectively. Almost one third of Oshikoto's datazones are in the most deprived 20 percent. Erongo and Karas do not have any datazones in the most deprived 10 percent. Less than 5 percent of the datazones in Karas, Khomas, Erongo and Omaheke are in the most deprived 20 percent.

Table 4.3: The 20 least deprived datazones on the NIMD 2001

Region	Percentage of datazones in most deprived 10% nationally	Percentage of datazones in most deprived 20% nationally
Caprivi	10.7	23.8
Erongo	0.0	4.8
Hardap	2.7	6.7
Karas	0.0	2.9
Kavango	20.8	41.1
Khomas	0.8	3.2
Kunene	12.2	24.3
Ohangwena	24.0	41.2
Omaheke	2.5	4.9
Omusati	13.5	24.9
Oshana	1.2	8.4
Oshikoto	18.2	32.7
Otjozondjupa	1.5	5.8

"Almost one quarter of Ohangwena's datazones and over one fifth of Kavango's datazones are in the most deprived 10 percent nationally. These two regions also have a very similar percentage of datazones in the most deprived 20 percent nationally"

Chart 4.1 shows the minimum, maximum and median rank of datazones in each region, and the interquartile range for the overall NIMD. Before describing the results, it is instructive to provide details about how to interpret the chart (using Oshikoto region as an example).



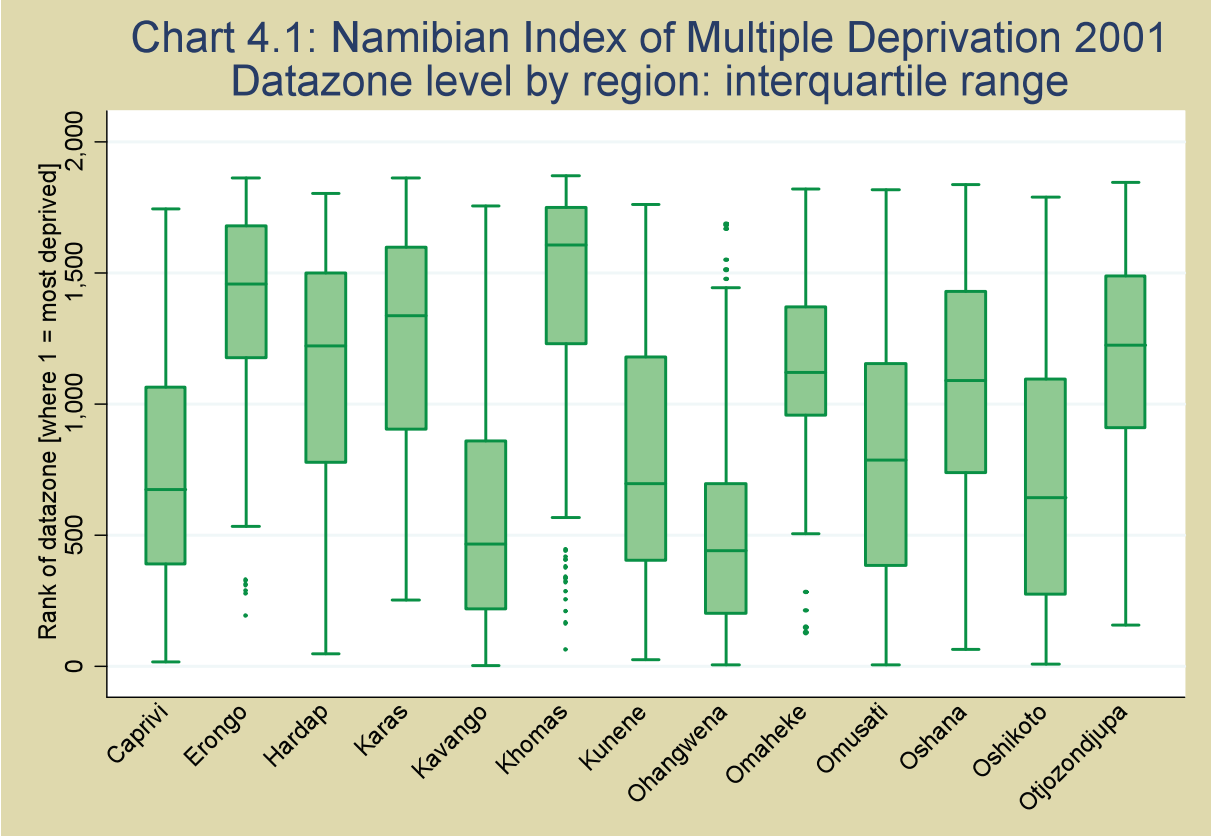
How to interpret the interquartile range charts

The **vertical green line for each region** shows the range of the ranks of the datazones in a region. The most deprived datazone in Namibia is ranked 1, and the least deprived datazone is ranked 1,871. The **'T' at the top of the green line** shows the rank of the least deprived datazone in the region. The **'upside-down T' at the bottom of the green line** shows the rank of the most deprived datazone in the region. In some instances, **small dots** are shown on the chart at either end of the lines. These are data points that lie more than 1.5 times the interquartile range away from the nearer quartile value. In these cases, the dots closest to the edge of the chart indicate the rank of the most deprived datazone in the region.

The **green box for each region** shows the range of the NIMD or domain ranks of the middle 50 percent of datazones in the region (the interquartile range). The **horizontal line within the box for each region** represents the rank of the median datazone within that region. If the box is relatively short this indicates that datazones are ranked in a narrow range, with similar NIMD or domain ranks (and therefore similar levels of multiple deprivation). If this box sits towards the bottom of the chart it tells us that datazones in the region are concentrated in the most deprived part of the national distribution of the NIMD or domain. If the box sits towards the top of the chart it tells us that the ranks of the datazones in the region are concentrated in the least deprived part of the national distribution.

The charts therefore provide an information rich summary – at regional level – of the datazones in each region.

Chart 4.1 below shows that most regions have a wide range of multiple deprivation, and all have at least one datazone in the most deprived third of the distribution. Caprivi, Kavango, Ohangwena, Omusati and Oshikoto regions have their datazones concentrated at the most deprived end of the spectrum. In contrast, Erongo, Karas and Khomas have their datazones concentrated in the least deprived part of the national distribution.



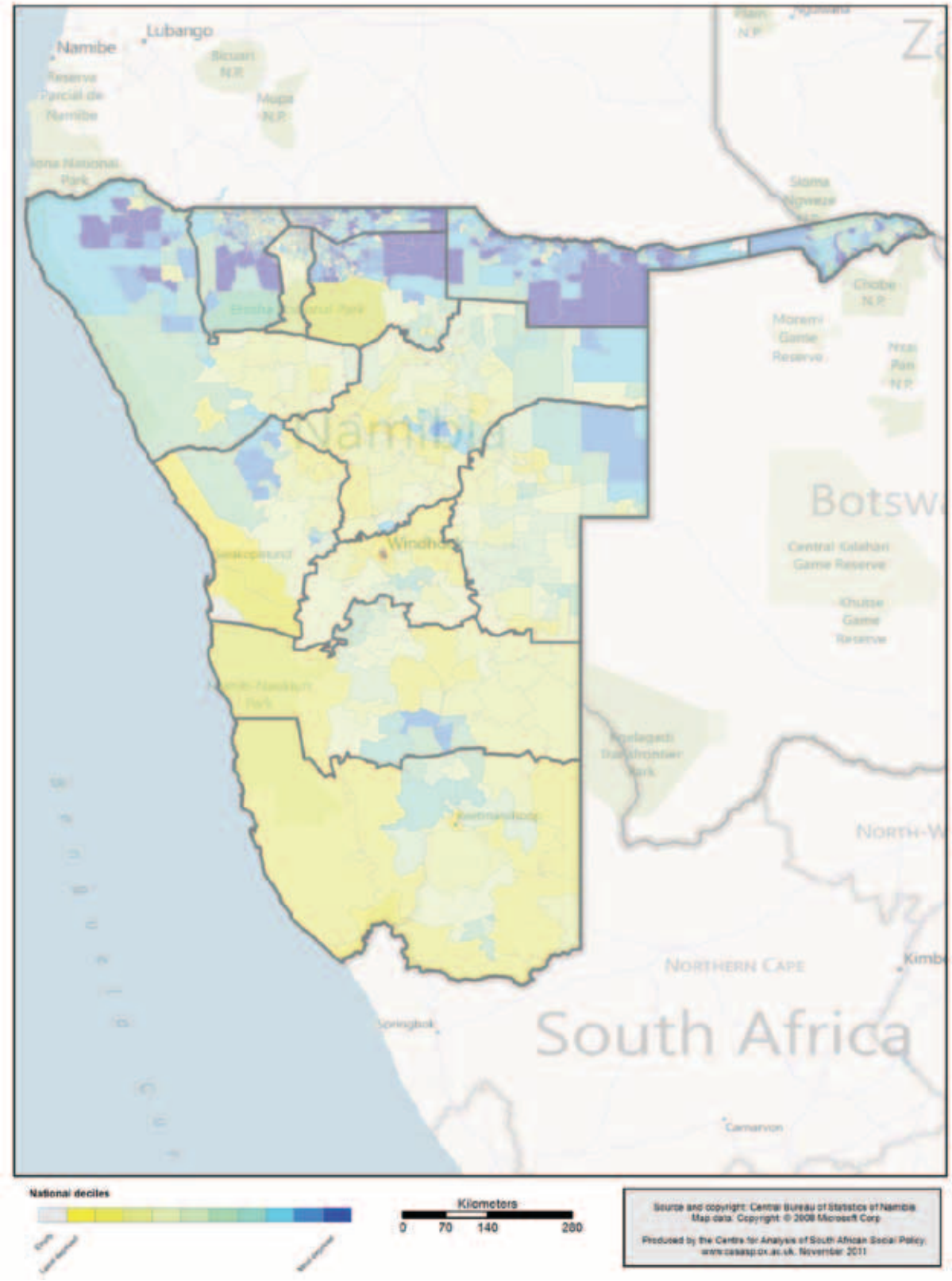
How to interpret the maps

The maps in this section of the report relate to the whole of Namibia and are presented at datazone level. The datazones are divided into ten equal groups – deciles – which enables one to identify the 10 percent most deprived datazones in the country (shaded deep blue) through to the 10 percent least deprived datazones in the country (shaded yellow). A map of Namibia outlining the 13 regions in Namibia, showing their names and boundaries, can be found in Annex 4 for ease of reference. Some datazones do not have a score for the overall NIMD or separate domains and are therefore shaded in grey. Using Google Earth Historical Imagery it was possible to investigate these datazones and confirm that they did not have anyone living in them in 2001.

The most deprived datazones in Namibia on the overall measure of multiple deprivation are mainly located in the north of the country. However, the north is not uniformly highly deprived; there is a range of deprivation, including some of the least deprived datazones in the country.

Map 1 shows the NIMD for the whole of Namibia.

Map 1: Namibian Index of Multiple Deprivation 2001



4.2 Domains of deprivation

Although it is not possible to calculate multiple deprivation rates as such, the rates of each of the individual domains of deprivation can be presented at both national and regional levels. And for all domains, except the Health Deprivation Domain, the domain scores can be compared. Further it is possible to calculate deprivation rates for each domain at constituency level, results of which are presented in the thirteen regional level reports.

At a national level, and based on the definitions of deprivation used in the NIMD:

- 64.7 percent of the total population experience material deprivation;
- 31.4 percent of the economically active population experience employment deprivation;
- 63.5 percent of working age people (15-59 inclusive) are educationally deprived;
- 81.1 percent of the total population experience living environment deprivation.

Table 4.4 below shows the rates of the individual domains of deprivation (excluding the Health Deprivation Domain where the score is not calculated as a rate) for each of the regions in Namibia. So, for example, 73.5 percent of the population in Caprivi Region experienced material deprivation in 2001.

Table 4.4: Regional level domain scores for five domains in the NIMD 2001

Region	Material Deprivation (%)	Employment Deprivation (%)	Education Deprivation (%)	Living Env. Deprivation (%)
Caprivi	73.5	17.5	63.2	90.2
Erongo	27.4	34.2	63.0	56.2
Hardap	42.9	33.9	69.4	65.5
Karas	37.2	28.6	67.8	65.3
Kavango	75.1	20.4	72.4	95.5
Khomas	38.0	29.4	51.4	52.1
Kunene	79.4	23.5	75.2	87.8
Ohangwena	86.0	37.3	65.4	97.2
Omaheke	62.8	24.0	71.6	86.3
Omusati	83.2	36.5	63.1	95.1
Oshana	57.5	40.8	58.4	81.4
Oshikoto	83.4	45.2	65.8	88.8
Otjozondjupa	57.0	31.7	68.2	74.2
Namibia	**64.7**	**31.4**	**63.5**	**81.1**

In terms of material deprivation, the most deprived region is Ohangwena where 86.0 percent of the population is materially deprived. The next most deprived regions on this domain are Oshikoto (83.4 percent) and Omusati (83.2 percent). The least materially deprived region is Erongo (27.4 percent), followed by Karas (37.2 percent) and Khomas (38.0 percent).

The most employment deprived regions are Oshikoto (45.2 percent) and Oshana (40.8percent). Caprivi is the least employment deprived region at 17.5 percent of the population. Education deprivation is highest in Kunene (75.2 percent), followed by Kavango (72.4 percent) and Omaheke (71.6 percent). Khomas (51.4 percent) is the least deprived in terms of education. Ohangwena (97.2 percent), Kavango (95.5 percent) and Omusati (95.1percent) have the highest levels of living environment deprivation, while Khomas (52.1 percent) and Erongo (56.2 percent) have the lowest levels of living environment deprivation.

Table 4.5 shows the percentage of constituencies in which a certain proportion of datazones are in the most deprived 10 percent of datazones nationally for the different domains of deprivation. This gives an indication of the extent to which the highest levels of deprivation are concentrated in particular constituencies. With the exception of the Health Deprivation Domain, over half of the constituencies do not have any datazones in the most deprived 10 percent nationally for those domains – material, employment, education and living environment domains. The highest levels of deprivation are thus concentrated in less than half of the constituencies. For these domains- material, employment, education and living environment-, a small but significant percentage of constituencies have over 50 percent of their datazones in the most deprived 10 percent. For example, in seven constituencies (6.5 percent of all the constituencies) over half of the datazones are in the most deprived 10 percent in relation to material and employment deprivation.

There are a few constituencies where three quarters or more of the datazones are in the most deprived 10 percent nationally:

- In terms of material deprivation there is one constituency: Okongo in Ohangwena Region.
- In terms of employment deprivation there are two constituencies: Endola and Ongenga, both in Ohangwena Region.
- In terms of living environment deprivation there are two constituencies: Linyanti and Sibinda, both in Caprivi Region.

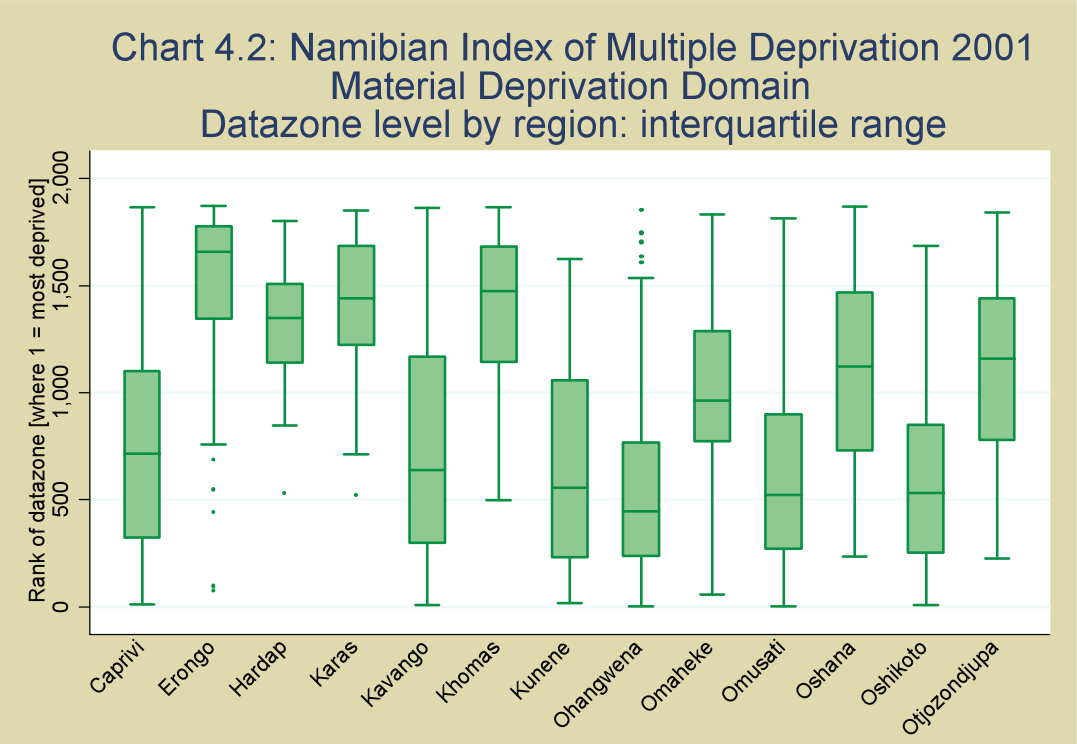
With regard to health deprivation, however, the highest levels of deprivation are shared amongst datazones in a greater number of constituencies. For example, 55 percent of constituencies have at least one datazone in the most deprived 10 percent of datazones nationally, and there is just one constituency where half or more of the datazones are in the most deprived 10 percent (Kongola in Caprivi Region). It is important to note however, that there are no constituencies where all datazones are in the most deprived 10% of datazones nationally on any domain.

> “For example, 55 percent of constituencies have at least one datazone in the most deprived 10 percent of datazones nationally, and there is just one constituency where half or more of the datazones are in the most deprived 10 percent”

Table 4.5: Percentage of constituencies in the most deprived 10 percent of datazones nationally

Domain	Percentage of constituencies where no datazones are in the most deprived 10%	Percentage of constituencies where 25% or more of datazones are in the most deprived 10%	Percentage of constituencies where 50% or more of datazones are in the most deprived 10%	Percentage of constituencies where 75% or more of datazones are in the most deprived 10%
Material Deprivation	63.6	16.8	6.5	0.9
Employment Deprivation	62.6	12.1	6.5	1.9
Health Deprivation	44.9	12.1	0.9	0.0
Education Deprivation	55.1	19.6	5.6	0.9
Living Env. Deprivation	66.4	16.8	3.7	1.9

"With the exception of the Health Deprivation Domain, over half of the constituencies do not have any datazones in the most deprived 10 percent nationally for those domains – material, employment, education and living environment domains. The highest levels of deprivation are thus concentrated in less than half of the constituencies."



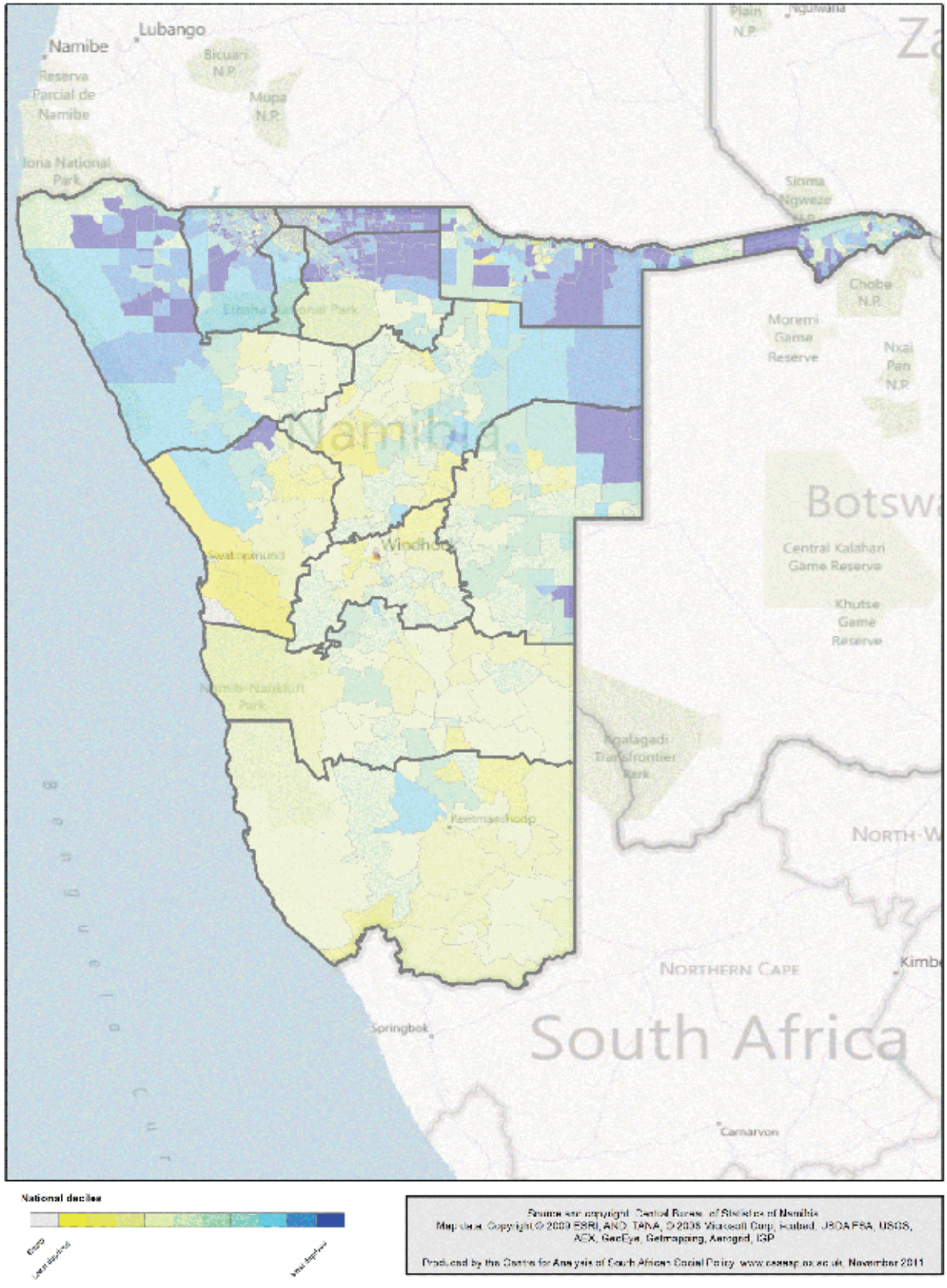
The following box plot charts present the interquartile range of the datazone ranks of deprivation for each region for each of the domains separately. A more detailed examination of patterns of deprivation within each region, including at constituency level, is however, presented in the regional reports.

Chart 4.2 shows the interquartile range for material deprivation. The datazones in Caprivi, Kavango, Kunene, Ohangwena, Omusati, and Oshikoto are concentrated towards the deprived end of the spectrum. This is in contrast to Erongo, Hardap, Karas and Khomas where the datazones are concentrated towards the less deprived end of the distribution.

Map 2 presents material deprivation at datazone level for the whole of Namibia. As can be seen from the map, the most deprived datazones (shaded deep blue) can be found in the north of the country, particularly in Kunene, Omusati, Ohangwena, Oshikoto, Kavango and Caprivi. There are however, pockets of material deprivation in Erongo and Omaheke, which as depicted in Chart 4.2 above have their datazones concentrated towards the less deprived end of the national distribution.

> "As can be seen from the map, the most deprived datazones can be found in the north of the country, particularly in Kunene, Omusati, Ohangwena, Oshikoto, Kavango and Caprivi."

Map 2: Namibian Index of Multiple Deprivation 2001 - Material Deprivation Domain



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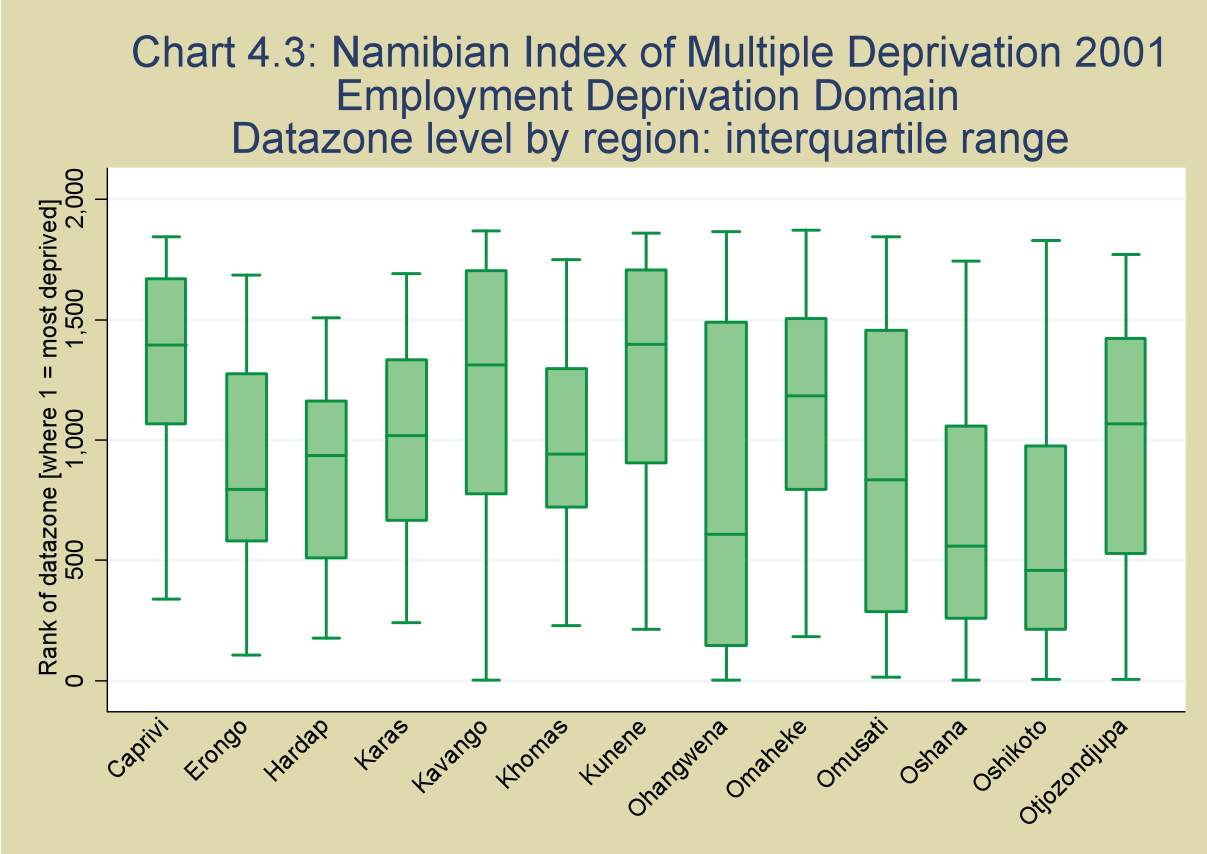
In terms of employment deprivation, the picture is rather different (see Chart 4.3 below). Some regions have a wide range of deprivation. Kavango, Ohangwena and Omusati in particular each have one of the five most deprived datazones and one of the five least deprived datazones in the country. Oshana and Oshikoto have fairly concentrated employment deprivation with a low median rank. In many other regions including Omusati and Ohangwena, though there is employment deprivation, the range is much greater with some datazones relatively less deprived. Caprivi and Kunene show relatively low levels of employment deprivation with datazones concentrated towards the less deprived end of the distribution and a high median rank.

The above pattern is reflected in Map 3 where the highest levels of employment deprivation are evident in datazones in Omusati, Oshana, Ohangwena and Oshikoto regions in the north. However, pockets of deprivation can be found in several other regions.



Map 3: Namibian Index of Multiple Deprivation 2001 - Employment Deprivation Domain

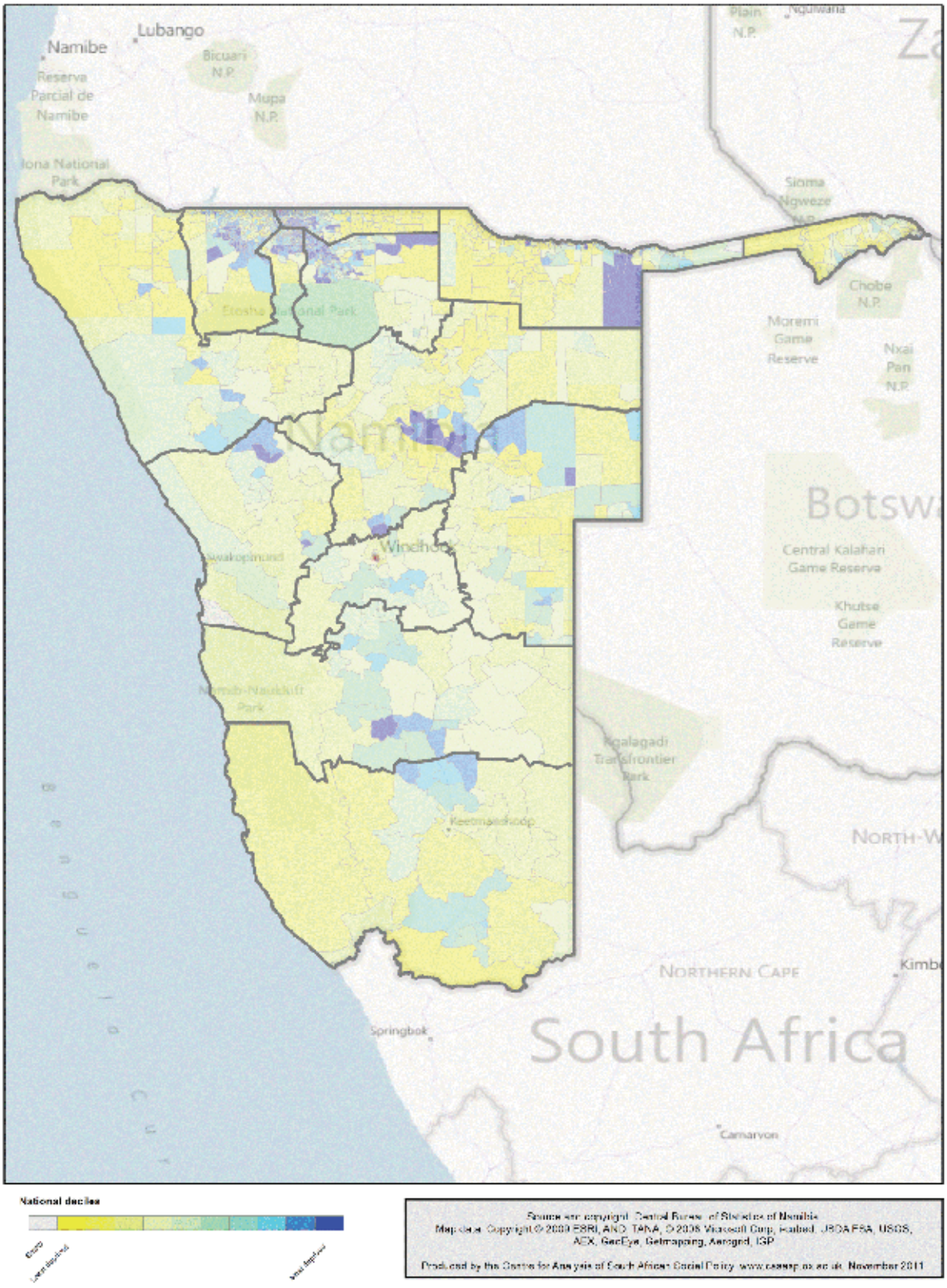
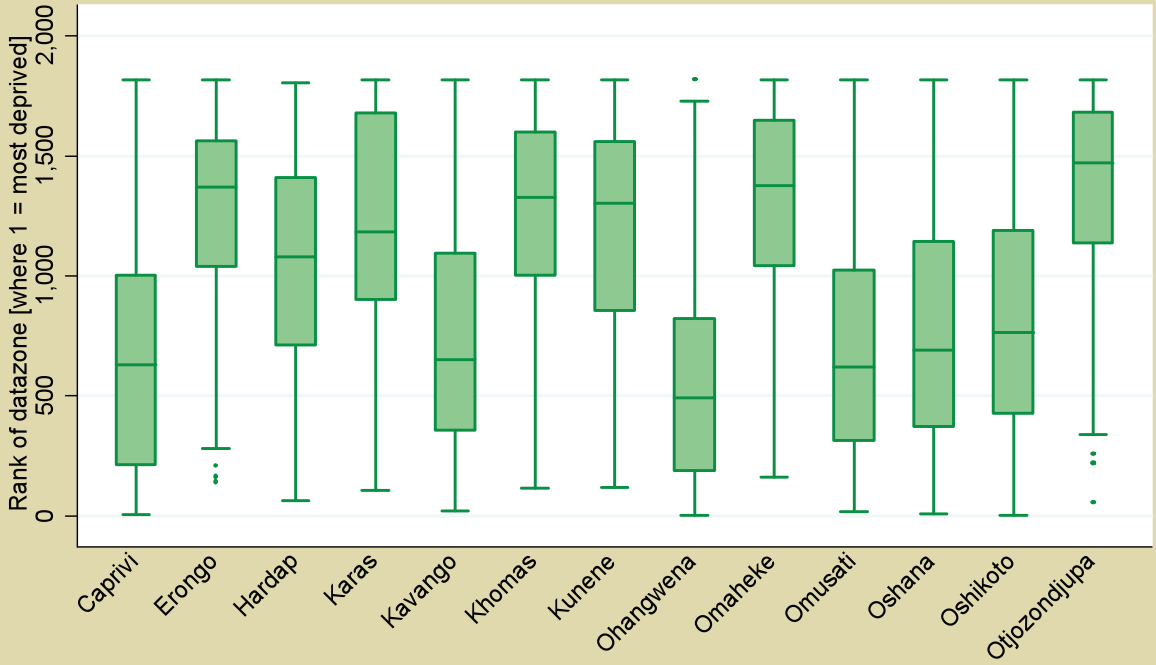


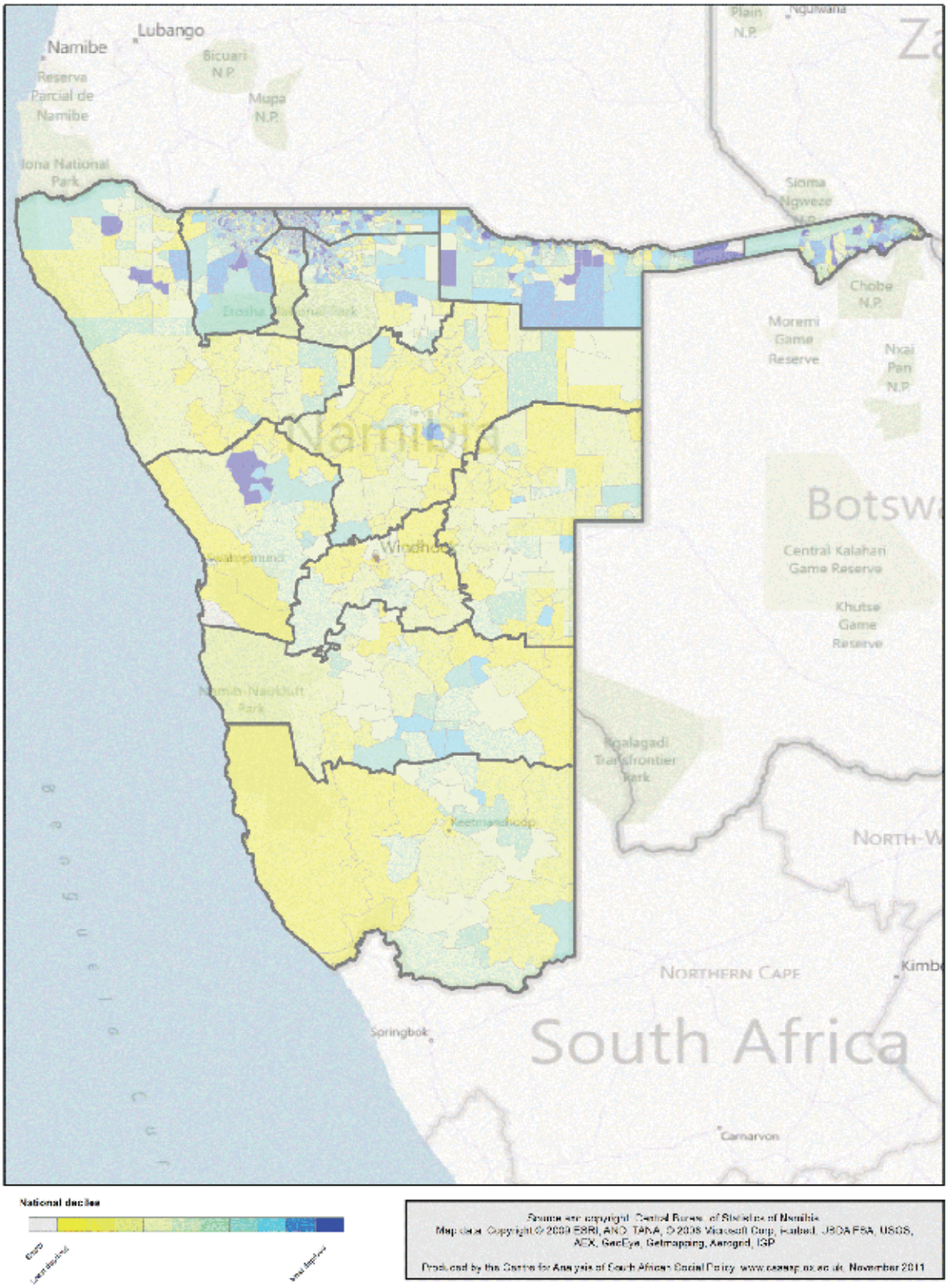
Chart 4.4 presents patterns of health deprivation at the regional level. A number of regions have a fairly wide range of deprivation, containing some of the most deprived datazones as well as some of the least deprived. They can be divided into two groups: one group where deprivation is concentrated at the most deprived end of the distribution (Caprivi, Kavango, Ohangwena, Omusati, Oshana and Oshikoto) and another group where deprivation is concentrated at the least deprived end of the spectrum (Erongo, Hardap, Karas, Khomas, Kunene, Omaheke and Otjozondjupa).

Map 4 presents health deprivation at datazone level. The most deprived datazones on this domain are scattered throughout the northern regions, particularly Omusati, Oshana, Ohangwena, Oshikoto, Kavango and Caprivi.

Chart 4.4: Namibian Index of Multiple Deprivation 2001
Health Deprivation Domain
Datazone level by region: interquartile range



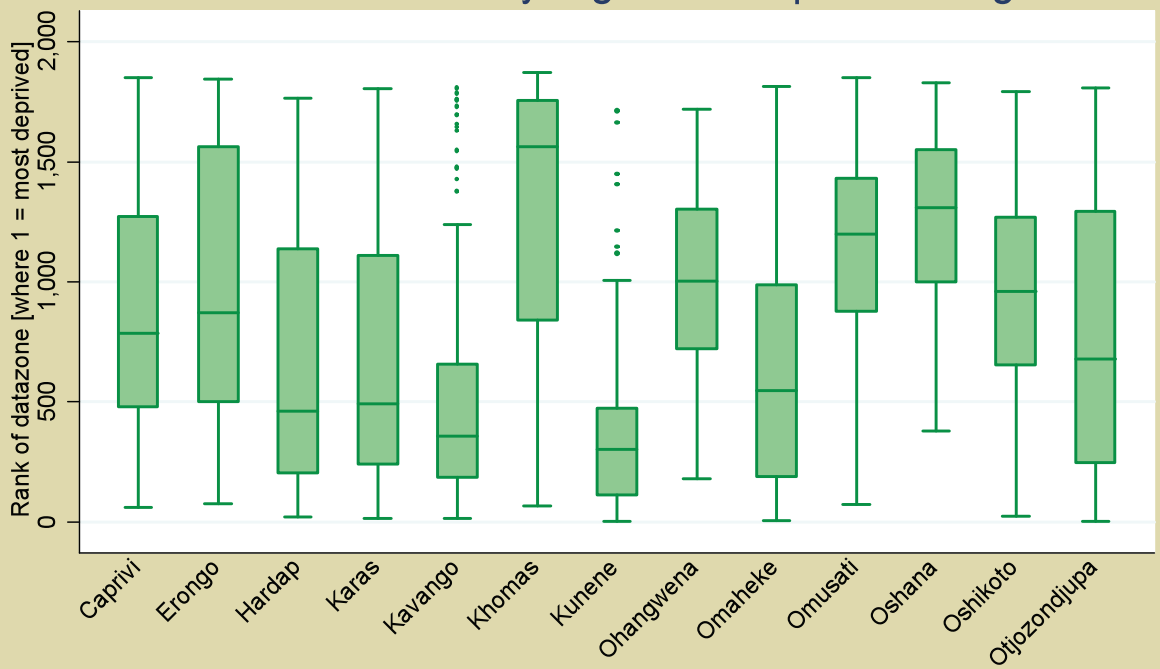
Map 4: Namibian Index of Multiple Deprivation 2001 - Health Deprivation Domain



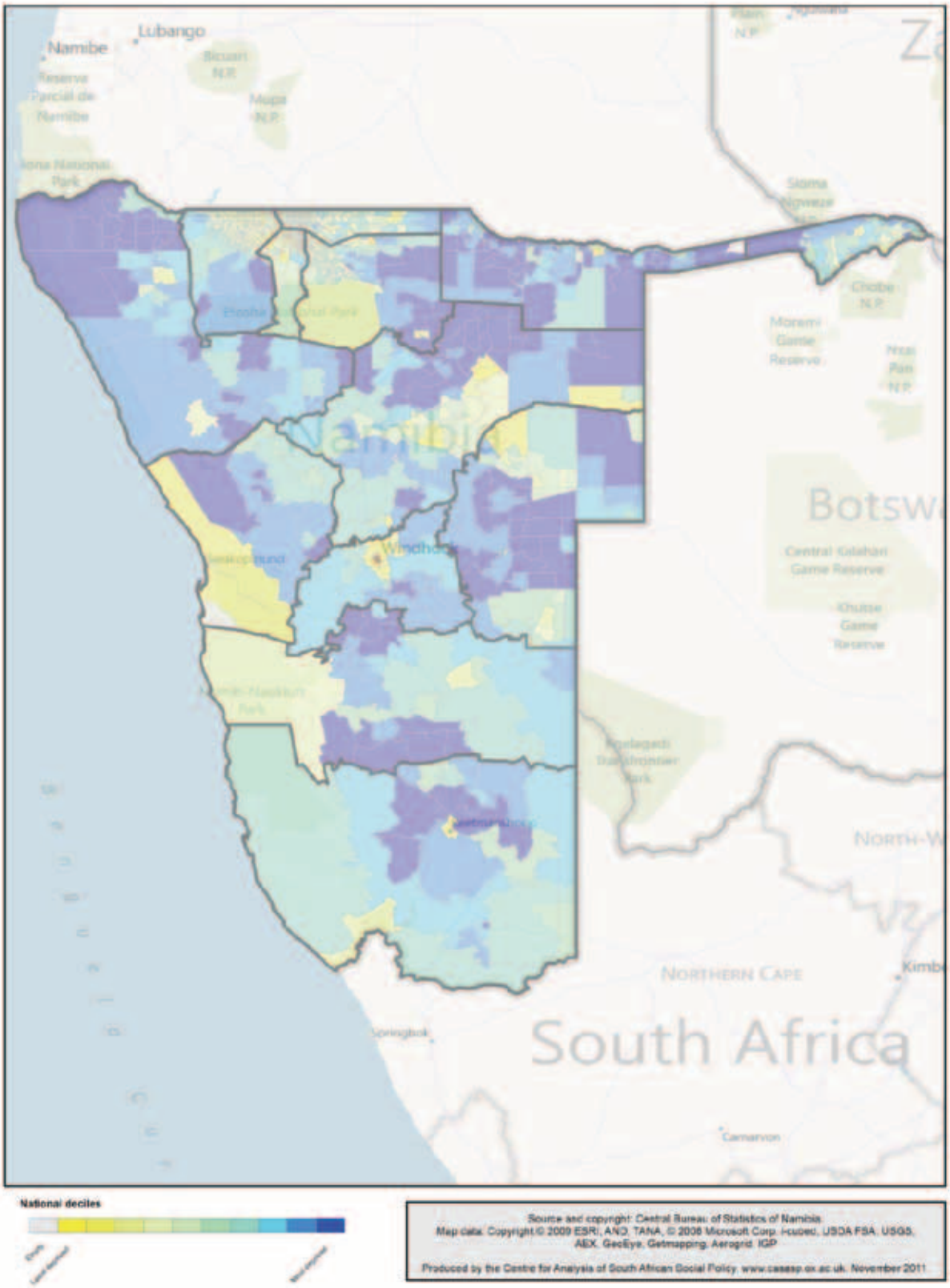
With regard to education deprivation (see Chart 4.5), most regions have a wide range of deprivation. Three regions have very distinctive patterns with respect to education deprivation. The datazones in Khomas are concentrated at the least deprived end of the distribution (all but one of the least deprived 20 datazones are in Khomas) whereas the datazones in Kavango and Kunene are concentrated at the most deprived end of the distribution.

Given the wide range of deprivation in most regions, it is not surprising that the map of education deprivation shows some of the most deprived datazones in all the regions of Namibia (see Map 5).

Chart 4.5: Namibian Index of Multiple Deprivation 2001
Education Deprivation Domain
Datazone level by region: interquartile range



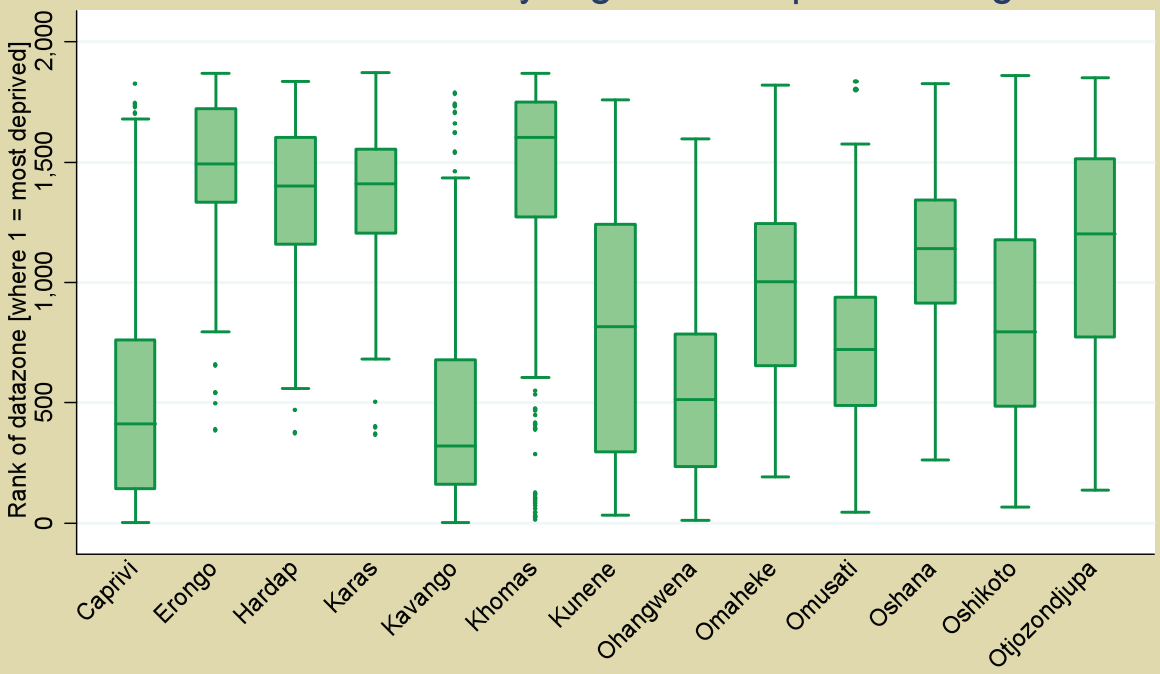
Map 5: Namibian Index of Multiple Deprivation 2001 - Education Deprivation Domain



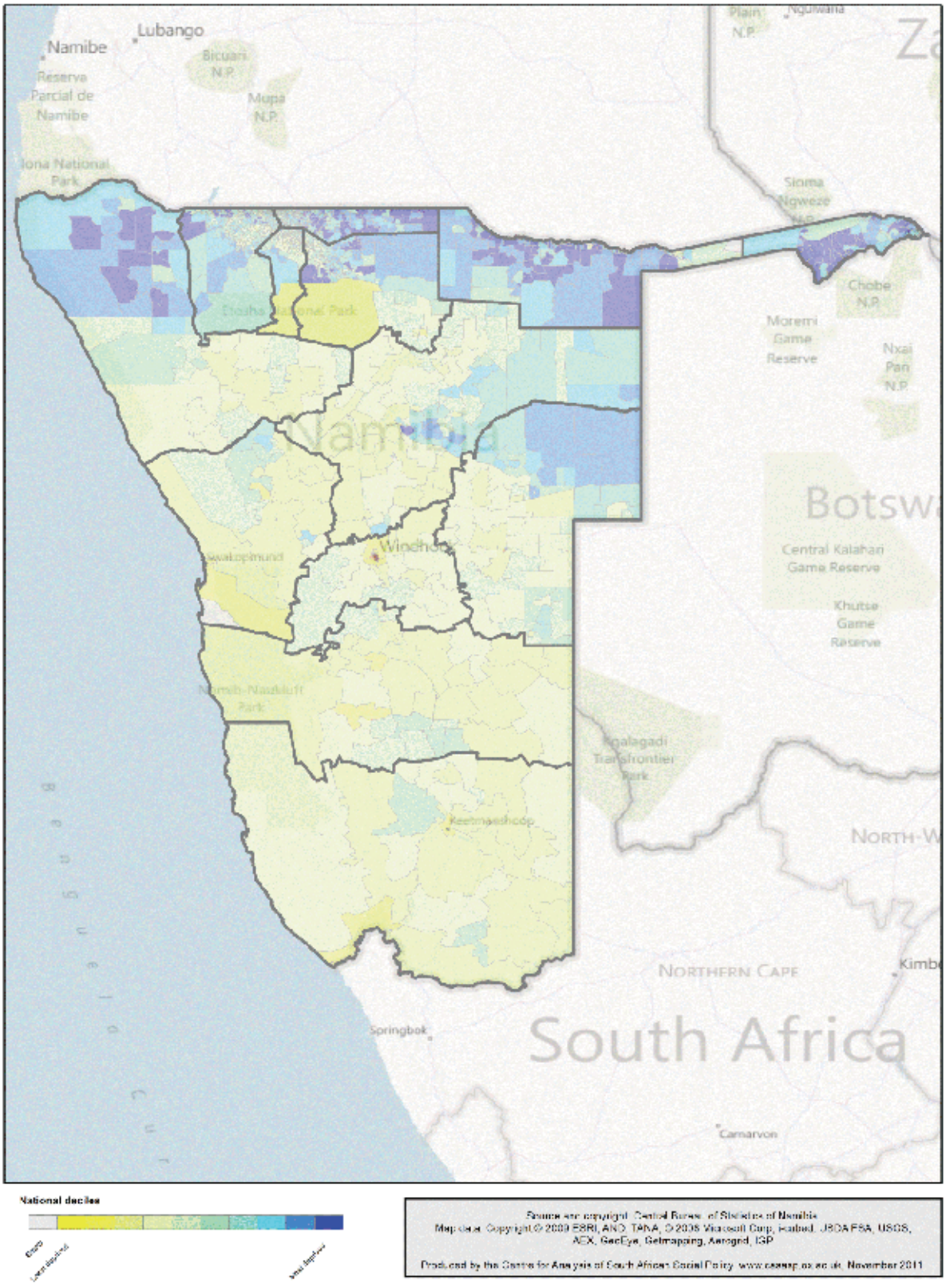
The picture in terms of living environment deprivation across the regions is quite varied, as shown in Chart 4.6 below. The datazones in Caprivi, Kavango and Ohangwena are concentrated at the most deprived end of the spectrum. On the other hand, constituencies in Erongo, Hardap, Karas and Khomas are concentrated towards the least deprived end of the national distribution. Deprivation in the other regions is mainly concentrated in the middle of the distribution.

Map 6 presents living environment deprivation at datazone level for the whole of Namibia. The most deprived datazones are located in the north in Kunene, Omusati, Ohangwena, Oshikoto, Kavango and Caprivi. There are also pockets of deprivation in Khomas.

Chart 4.6: Namibian Index of Multiple Deprivation 2001
Living Environment Deprivation Domain
Datazone level by region: interquartile range



Map 6: Namibian Index of Multiple Deprivation 2001 - Living Environment Deprivation Domain



SECTION 5: CONCLUSIONS AND SOME POLICY RECOMMENDATIONS

The datazone level NIMD profiles multiple deprivation in Namibia, clearly identifying and delineating some of the most deprived areas. The construction of datazones - area units of roughly equal population size of 1000 people– has enabled pockets of deprivation in otherwise less deprived areas to be revealed.

Additional and more in-depth analysis at regional level, presented in thirteen separate reports, however, provides a more detailed profile of deprivation within each region.

There are many ways in which the NIMD profiles presented in this report can support pro-poor policy formulation processes and programmatic interventions. By providing reliable and objective information on, and profiling the distribution of multiple deprivation and the individual domains of deprivation across the country, the NIMD can provide policy and decision makers with the evidence base on which to make decisions regarding resource allocation and the geographic areas and sectors in which to prioritise public investments, government support and service delivery relating to the various domains of deprivation. Specifically, the NIMD can be useful for:

Interrogating the causes of inequality: The NIMD, presented at datazone level, provides a useful starting point for interrogating the reasons for the existence of wide inter-regional (and intra-regional) variations with respect to specific domains and the overall combined index of deprivation.

Temporal analysis of nature, scope and effects of poverty reduction programmes: By describing the geographical distribution and extent of individual dimensions of deprivation and of overall multiple deprivation, the NIMD can also provide a baseline map of deprivation against which progress in poverty reduction in these areas can be measured

"By providing reliable and objective information on, and profiling the distribution of multiple deprivation and the individual domains of deprivation across the country, the NIMD can provide policy and decision makers with the evidence base on which to make decisions regarding resource allocation and the geographic areas and sectors in which to prioritise public investments, government support and service delivery relating to the various domains of deprivation"

over time. The NIMD, presented in this report, is based on data relating to 2001 time- line and significant changes may have taken place since then. It will thus be necessary to conduct further analyses using the 2011 Census data and information in order to shed light on the extent to which changes have occurred and possible reasons for any noted changes.

Better planning and targeting of public investments: The NIMD allows for better planning for, and targeting of, public investments aimed at poverty reduction, on the basis of relative deprivation to smallest possible administrative units – datazone level. Priorities can be identified at the datazone level that can be addressed through integrated development approaches. Importantly, fiscal transfers from national and regional governments could be targeted to, and ring-fenced for, those sectors/domains in which specific datazones are particularly deprived or to the most deprived datazones within the regions and/or constituencies. It is also conceivable that regions, constituencies and datazones characterised by severe multiple deprivation could be targeted for integrated development/poverty reduction projects and programmes.

Moving towards a paradigm shift in development planning: Policy and decision makers may find the NIMD useful in initiating a process of national dialogue around possible re-design of the country's development planning and project/programme implementation architecture to be more targeted and focussed on people's needs and the extent of deprivation. Specifically, the NIMD can be useful in providing a basis for meaningfully shifting the development discourse from the national to the regional and sub-regional (constituency) levels. For instance, policy and decision makers could consider institutionalizing a NIMD-weighted Equalization (Development) Fund whereby regions, and subsequently constituencies and datazones, receive development funds and other resources on the basis of the relative weights of their NIMD.

It should be noted however, that the NIMD 2001provides only a profile of *relative* deprivation across Namibia. Even the least deprived areas contain pockets of deprivation. They are simply less deprived than other areas with higher levels of deprivation. As such, spatially targeted policy initiatives, if considered by policy and decision makers as a possible policy option for the country, should be regarded as a complement to, rather than a substitution for, mainstream pro-poor policies and strategies that the National Government and Regional Councils are already implementing.

ANNEX 1: INDICATORS INCLUDED IN THE NIMD 2001

Material Deprivation Domain

Numerator

- Number of people living in a household with no access to a television or a radio; or
- Number of people living in a household with no access to a telephone/cell phone

Denominator

Total population

Employment Deprivation Domain

Numerator

- Number of people aged 15-59 who are unemployed

Denominator

Total economically active population aged 15-59 inclusive

Health Deprivation Domain

Numerator

- Years of potential life lost

Education Deprivation Domain

Numerator

- Number of 15-59 year olds (inclusive) with no schooling completed at secondary level or above; or
- Number of 15-59 year olds (inclusive) who are illiterate

Denominator

Population aged 15-59 (inclusive)

Living Environment Deprivation Domain

Numerator

- Number of people living in a household without the use of electricity, paraffin or solar power for lighting; or
- Number of people living in a household without access to a flush toilet or pit latrine (ventilated or long drop); or
- Number of people living in a household without piped water/borehole/borehole with covered tank (but not open tank)/protected well inside their dwelling or yard or within 200 metres; or
- Number of people living in a household that is a shack; or
- Number of people living in a household with three or more people per room

Denominator

Total population

ANNEX 2: THE SHRINKAGE TECHNIQUE[4]

In some areas, particularly where populations at risk are small, data may be 'unreliable', that is more likely to be affected by measurement error or sampling error, with particular datazones getting unrepresentatively low or high scores on certain indicators. The extent of a score's 'unreliability' can be measured by calculating its standard error. A technique known as 'shrinkage estimation' (i.e. empirical Bayesian estimation) has been used to deal with this problem.

Shrinkage involves moving unreliable datazone scores (i.e. those with a high standard error) towards another more robust score. This may be towards more deprivation or less deprivation. There are many possible candidates for the more robust score to which an unreliable score could move. The constituency mean has been selected for this purpose but others could, in theory, include the regional or national mean or the mean of areas with similar characteristics.

Arguably, the movement of unreliable scores towards the mean score for Namibia would be inappropriate because of the large variation across the country and because it would be preferable to take into account local circumstances. Even within regions there is considerable variation, and it was therefore concluded that shrinkage to the constituency mean was the best and most reliable procedure. This is in essence the same as shrinking to the population weighted datazone mean for a constituency.

The actual mechanism of the procedure is to estimate deprivation in a particular datazone using a weighted combination of (a) data from that datazone and (b) data from the constituency. The weight attempts to increase the efficiency of the estimation, while not increasing its bias. If the datazone has a high standard error and a region appears to be an unbiased estimation of the datazone score then the datazone score moves towards the constituency score.

Although most scores move a small amount, only unreliable scores, that is those with a large standard error, move significantly. The amount of movement depends on both the size of the standard error and the amount of heterogeneity amongst the datazones in a constituency.

The 'shrunken' estimate of a datazone level proportion (or ratio) is a weighted average of the two 'raw' proportions for the datazone and for the corresponding constituency.[5]

[4] This section is a modified version of that contained in the technical annex to Noble et al. (2006a).

[5] Where appropriate the weighted average is calculated on the logit scale, for technical reasons, principally because the logit of a proportion is more nearly normally distributed than the proportion itself.

The 'shrunken' datazone level estimate is the weighted average

$$z_j^* = w_j z_j + (1 - w_j) z \qquad [1]$$

where z_j is the datazone level proportion, z is the constituency level proportion, w_j is the weight given to the 'raw' datazone -*j* data and $(1-w_j)$ the weight given to the overall proportion for the constituency. The formula used to determine w_j is

$$w_j = \frac{1/s_j^2}{1/s_j^2 + 1/t^2} \qquad [2]$$

where s_j is the standard error of the datazone level proportion, and t^2 is the inter-datazone variance for the *k* datazones in the constituency, calculated as

$$t^2 = \frac{1}{k-1} \sum_{j=1}^{k} (z_j - z)^2 \qquad [3]$$

ANNEX 3: EXPONENTIAL TRANSFORMATION

In order to combine the domains into an overall NIMD, the domain scores are first standardised by ranking and then the ranks are transformed to an exponential distribution. The exponential distribution has a number of properties, most importantly that it enables control over cancellation and it helps identify the most deprived constituencies.

The purpose of exponential transformation is to adjust the range of each transformed domain to make them comparable. This is important when the domains are combined because simply averaging the ranks could result in high deprivation in one domain being cancelled out by low deprivation on a different domain.

Applying the exponential transformation converts each domain to a distribution with a range of 0 to 100, and a score of 100 for the most deprived small area. Twenty five per cent of small areas have a score higher than 50. The skewness in the transformed distribution reduces the extent to which deprivation on one domain can be cancelled by lack of deprivation on another. The exponential transformation formula selected enables the most deprived datazones to be identified. The formula distributes the scores to stretch out the 25% highest scoring (most deprived) datazones and compress the less deprived end of the distribution.

The transformation used is as follows. For any datazone, denote its rank on the domain, scaled to the range [0,1], by R (with R=1/N for the least deprived, and R=N/N, i.e. R=1, for the most deprived, where N=the number of small areas in Namibia).

The transformed domain, X say, is $X = -45.5*\ln\{1 - R*[1 - \exp(-100/45.5)]\}$

where ln denotes natural logarithm and exp the exponential or antilog transformation.

ANNEX 4: REGIONAL BOUNDRIES

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