



New Zealand Emissions Trading Scheme: Using Computer-assisted Qualitative Data Analysis Software (CAQDAS) for Documentary Analysis

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

The present study examines documentary submission by Air New Zealand (NZ) [1], Business NZ [2], Greenpeace NZ [3] and Oxfam NZ [4] to the Emissions Trading Scheme (ETS) Review Committee in 2009. In doing so, this paper consulted Lewins and Silver's *Computer Assisted Qualitative Data Analysis Software (CAQDAS)* which seeks to familiarise researchers with CAQDAS software package [5]. But the continuously changing information technologies field suggests that the useful book is no substitute for an exploration of the specifics of NVivo 10 – released in 2012. Asking whether the NZ corporate businesses shares similar concerns on the issue of climate change, this article uses NVivo 10 to explore some ways in which CAQDAS can be used to simultaneously provide concise description of changes in relationships and in-depth documentary analysis. Two of the key themes that emerged from analysis are carbon market and internationalisation, whereas the main finding shows a consensus among the four organisations that the international community must act in unison so as to effectively address climate change issues. Cluster analysis shows that words can be broadly grouped into three where members of

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each group share common characteristics. Also, there is better relationship and more coherence between Greenpeace, Air NZ and Business NZ submissions than that of Oxfam. In addition to the fact that computer science was included in NZ high schools curriculum barely four years ago [6], the present paper is significant in that it would assist qualitative researchers who may be considering CAQDAS especially NVivo 10 as a qualitative method as well as facilitate public and corporate entities an avenue to express their opinions regarding climate change issues.

Keywords: Qualitative data analysis; qualitative research; computer-assisted data analysis; CAQDAS; NVivo 10.

1. INTRODUCTION

This section offers a brief synopsis of ETS profile in NZ, including the relevant sectors, and highlights this study's research question. The NZ ETS set international standard as the first comprehensive market-based mechanism applicable to GHG. Against the background of externalities, the ETS is a standard approach to trading that has its origins in a number of seminal works [7,8]. Although the ETS implementation began with the forestry sector in 2008 and finally agricultural GHG emissions from 2013 [9,10], the reduction of agricultural emissions – accounting for over half NZ's total GHG emissions – remains a key challenge for NZ. Accordingly, forestry and agriculture are two important sectors in respect of climate change because forestry offers the opportunity for carbon sequestration while agriculture is crucial due to its exposure to leakage [11]. In relation to the issue of agricultural emissions, NZ is committed to increased investment in climate change research primarily because the biggest challenge facing the nation is agriculture [12]. It is thus unsurprising that Wellington's biggest contribution to reducing dangerous climate change is its sustained development of the Global Research Alliance on agricultural GHG. However, there seems a consensus among most scholars that the success of NZ's ETS largely rest on the emergence of an open, viable, and liquid, international carbon market.

In a NZ context, the ETS is the primary mechanism of meeting international obligations on climate change whereas on a worldwide basis, its central goal is to mitigate the issue of greenhouse gases (GHG) and carbon emissions. The ETS not only puts a price on GHG as an incentive to reduce emissions but is also planned to cover all economic sectors in NZ by 2015. First legislated in 2008 [13], it was respectively amended in 2010 and 2012 to cover stationary energy, liquid fossil fuels, fishing and industrial processes sectors [14]. In contrast, the European

Union ETS (for instance) will affect both the competitiveness and cost structures of the sectors covered directly by the scheme [15]. In this context, a qualitative finding on the system dynamics of the effects of ETS on the NZ forestry sector shows that central to ETS effects is economic analysis – which in turn is influenced by public perceptions and future events [10]. One may then argue a case that the public in Australia and Britain understands the significance of *risk* in relation to addressing climate change effects [16].

Within that comparative lens, the position of corporate entities in relation to the problems of climate change is less than well understood in NZ. Given the policy implications of this lacuna, this qualitative analysis – which differs from the work of Doherty [17] – that attempts to fill the gap regarding the current extent of computer use in the NZ building and construction industry – would objectively contribute to knowledge through the researchable question that asks whether the NZ corporate businesses shares similar concerns on the issue of climate change. The framing of the succinctly clear and open-ended question is carefully considered. Because phrasing is crucial to expressing intents and meanings [18], this article recognises that analytical categories may be selected based on moral issues and normative theory. Recognising that the present study's research question-based analyses focus on the roles played by discourse, the choice of analytical categories is based, in part, on the role played by discussion in the promotion of ETS, the various formal levels and meanings of the documentary submissions were systematically examined for relationships that influence specific beliefs, express interests, and contribute to the various socio-political actions associated with ETS.

In comparative terms, the quantitative method is good for answering specifically narrow questions whereas qualitative approach is particularly known for researching problems without prior

knowledge of the variables been studied. This underpins the need for in-depth exploration in qualitative research [19]. Qualitative method, therefore, suit best when perhaps the most important aspect of this approach – research questions – raise issues that cannot be satisfactorily answered using other methodological approaches [20,21]. In agreement with Creswell's argument [19], the topic of the present study is broad whereby both ETS and CAQDAS constitutes the "central phenomenon" or "key concept". To this end, a number of software programmes were introduced, about two decades ago, for better management of the vast amounts of data that often results from qualitative research [22]. While such programmes comprises ePortfolio which is considered by students and industry representatives as a valuable management tool [23], Walker demonstrates how BeSTGRID computer network can assist new users to implement large scale social simulation project using grid computing [24]. In terms of here and now, CAQDAS software, originally developed in the 1960s but become quite popular in the early 1990s [25], is not only a continuously changing technology that enhance qualitative research analytics so much so some CAQDAS are only applicable to text while others can import data from video, images, audio, newspaper and textbooks.

In order to achieve the aims of the research project, this paper is structured as follows. The next section on justifications of method outlines the suitability of CAQDAS – by highlighting its potentials and constraints – to this study and also situates this qualitative analysis within existing thematically relevant scholarship. Then, the main outcomes of this study are explained in findings and interpretations section, which also details verification of the research questions, identification of the themes that emerged as well as commonalities and differences. The concluding section offers main findings including suggestions in relation to engagement with CAQDAS.

2. JUSTIFICATIONS OF METHODS

This section begins with a discussion on the relevance of CAQDAS in qualitative research and then looks the four documentary submissions as case studies. The main advantages of the CAQDAS software – Nvivo – used in the present study is not only its coding and flexible capabilities, but also the proficiency

with which data is defined and organised, resulting in better analysis of relationships and themes. This enables qualitative researchers to concentrate on "analytical techniques and intellectual thought in identifying meaning and emerging themes, rather than the manual tasks" [26]. However, each CAQDAS package system is unique and may not necessarily fit the purpose of specific qualitative study [27]. For some, CAQDAS bring too much familiarity with the data [25]. This, however, could be a potential pitfall – disengagement from the data which happened during the processing stages of the present study – due to the focus on the technique's process rather than data interpretation [26,28]. In saying so, familiarity with the software, on the one hand, is essential before embarking on the project. On the other hand, it is impossible to separate the researcher from the software [25]. Reason been that, in the case of the present study, the researcher determined not only the selection and number of documentary submissions subjected to NVivo analyses, but also which coding and graphical representation styles seems appropriate for the purpose of the study.

For case studies, the present paper adopts Air NZ and Business NZ (corporate entities), Greenpeace NZ and Oxfam NZ (NGOs) documentary submissions to the ETS review committee. Central to case study concept, which facilitated the emergence of new themes and relationships during the analytical stages of the present study, is its capability to answer the four research questions. Nonetheless, this concept is contentious partly due to its encroachment into grounded theory, ethnography, life history and participant observation method [29]. But, qualitative case study which largely rest on inductive reasoning is descriptive, particularistic and heuristic. Moreover, it is an intensive and holistic description of a specifically significant social issue [30]. Case study is particularistic for the present study due to its focus on climate change effects and ETS in NZ. These are significant due to their revelation of NZ's position on climate change and what necessary actions the government may adopt to best address this issue.

Furthermore, interpretations of the documentary submissions were closely examined for relationships that may influence understandings of ETS and as a result, contribute to socio-political actions associated with ETS. In descriptive terms, the outcome of this analysis is a rich and in-depth description about climate

change issue in a NZ context. *In-depth* means complete description of the studied documentary submissions and descriptive interpretations of analysed data in terms of community values, deep-seated attitudes and cultural norms [31] as well as the four primary nodes – actions necessary, impacts, risks and strategies. In heuristic terms, the adopted method extends current understandings on climate change.

3. FINDINGS & INTERPRETATIONS

This section discusses data analysis and what are considered as themes identification, verification of the research questions, commonalities and differences, emerged insights and the main findings. The context of the analysis which is research questions-based thematically focuses on relevant 14 pages in Air NZ, 17 pages in Business NZ, 11 pages in Greenpeace NZ, and 17 pages in Oxfam's submissions. This research investigates the issues relevant to discourse analysis of parliamentary documents on climate change and ETS. Recognising that the analysed documents are structurally multileveled, as in most discourse analytics, it is possible to investigate textual factors such as themes and emerging themes, assumptions, internal coherence, metaphors, sentence structures, and so on. In sampling terms, the pdf files of the documentary submissions were imported as *internals sources*. Nodes were created in the context of a priori based expectations in NVivo premised on verbatim text and a posteriori based on emerging themes. The various nodes were then examined for relevant summaries. The occurrence of too many nodes necessitated further clustering into four *primary nodes* – actions necessary, impacts, risks and strategies – which facilitated easier interpretations. In particular, the creation of *analytic memo* facilitated categorical and thematic analysis whereas *procedural memo* summarised and tracked the initial numerous codes. These *memos* were not just useful as places to record changes to the coding categories but also enhanced analytical rigour by specifically detailing the added categories. Thereafter, a *framework matrix* was created to relate the case to the themes and then the development of *models* for graphical illustration of research findings.

Fig. 1 shows NVivo interface of the four documentary submissions as internal sources and the research questions while Fig. 2 depicts coding texts from the submissions (pdf versions)

to the four primary nodes. Fig. 3 shows coding labels attached to pieces of texts. While coding assisted in locating reference nodes when needed, the coding of various sections of a particular documentary submission to a node also means that all the coded text can be retrieved later in one place. In other words, a node is a collection of reference about a specific theme, phenomenon or other areas of interest [32]. Coding – the categorisation of data brought meaning to the texts and facilitates identification of patterns or themes (terminology, phrases used, concepts, ideas, and incidents) as well as organises texts into concisely coherent categories. It should be expected that when one see certain categories being invoked, one can logically expect certain information or themes to follow logically [28].

Fig. 4 depicts graphical representation of the relationships between the nodes, research questions and Air NZ document. This process was also conducted on the remaining three pdf documents. As an illustration, Fig. 4 presents the coding texts from an internal source – Air NZ document – as well as the relationships between the four *primary nodes* (actions necessary, impacts, risks and strategies). It can be seen that the *primary nodes* are directed towards the internal source. For one thing, the prerequisite for resolving the problem of interpretation is a commentary on the very conditions of the problem itself. As such, the basis for any credible analysis is not how a text is interpreted but the need for it in the first place – termed metacommentary [33]. From this perspective, contextual engagement with the historical situation of climate change was achieved through the identification of what exists in the social world and its manifestation [34]. According to Stivale [35], Ian Buchanan [36] argued that every author construct two meanings – which motivated the present study to seek ways to analyse the unwritten messages in the documentary submissions.

Data was accordingly adjusted to a small scale focusing on *Level One* analysis – which entails counting phrases, words, coincidences, and so on, within the analysed data [37]. Every collated extracts for each theme was closely analysed to ascertain whether they form a coherent pattern. Otherwise known as content analysis, the results from *Level One* analysis responds to manipulations by NVivo. In relation to this, Fig. 5 shows node summary for group query. The query tool, which thematically facilitates exploration of

the research questions not only retrieves all information crucial to answering these questions and facilitates complete investigation of the data, but also helps to analyse the word frequency count (Fig. 6) as well as what other words they were grouped with – important for delineating *similarity*. Furthermore, *matrix* coding permits complete narration of the texts and frequency of the tree node. From Fig. 7 depicting the frequency tree map, analysis shows that: New

Zealand, climate change, conditions, emissions, global, trading scheme, costs, price, and so on, corresponds to the first four columns of the tree map. This finding could be interpreted that these words would be central to the ETS. As such, policy-makers may find it useful to encourage further studies that thematically integrate these words as a focused research agenda. After customisation, the tag cloud (Fig. 8) shows the most commonly occurring words.

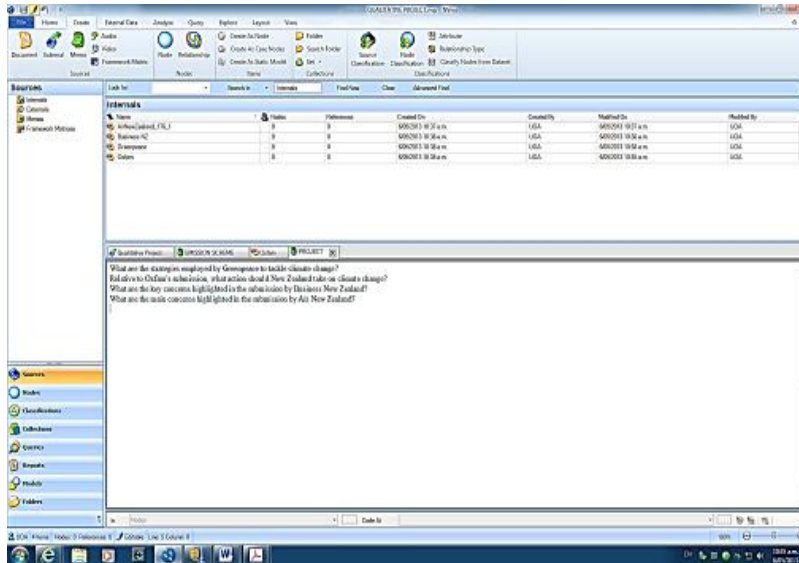


Fig. 1. NVivo interface for the four submissions as internal sources and the research questions

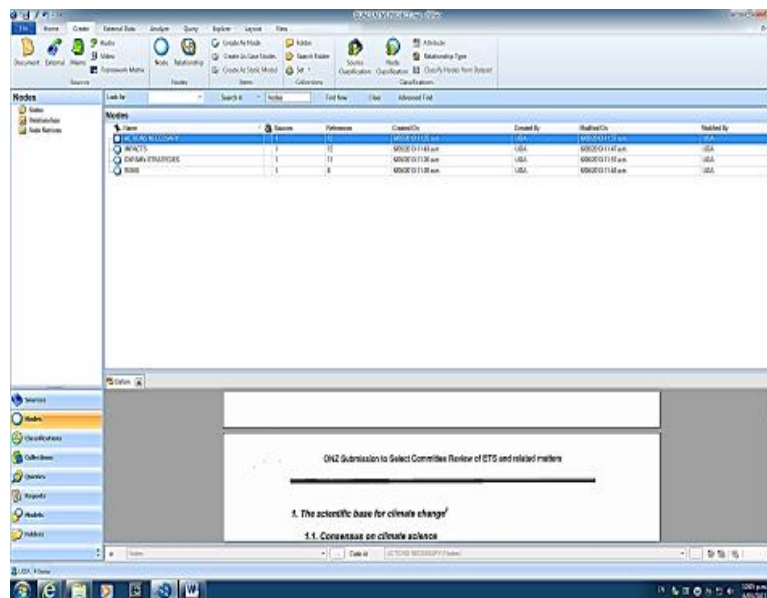


Fig. 2. NVivo interface with coding texts from the four documentary submissions (pdf documents) to the four primary nodes

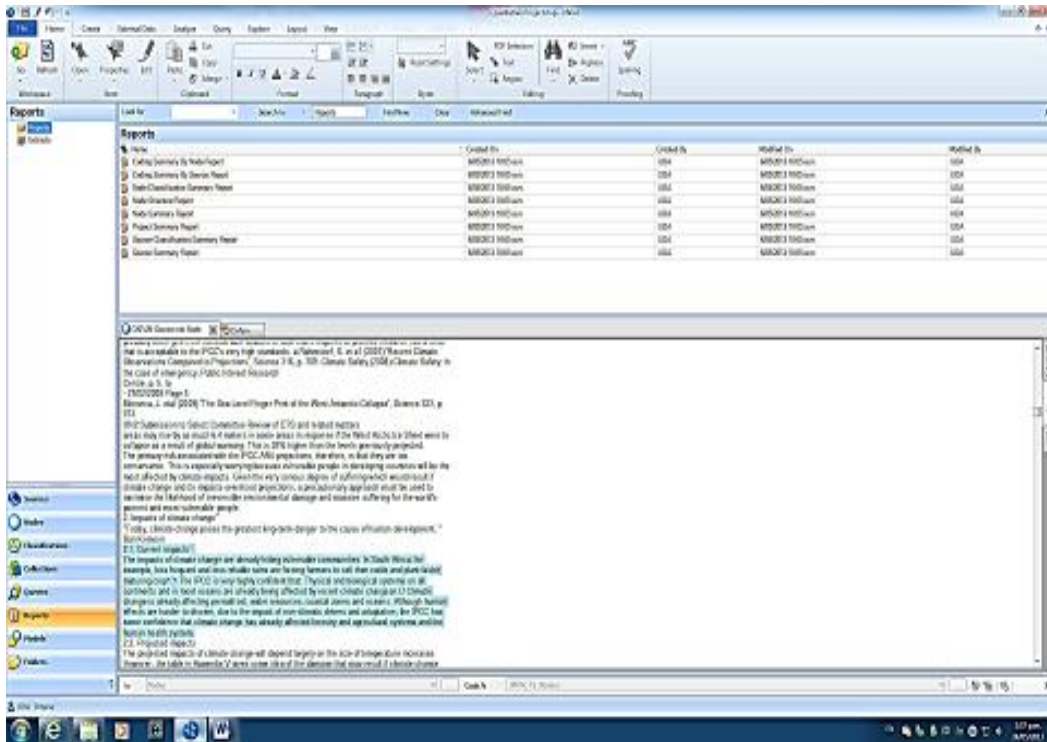


Fig. 3. NVivo interface with labels attached to pieces of texts from the four documentary submissions (pdf documents)

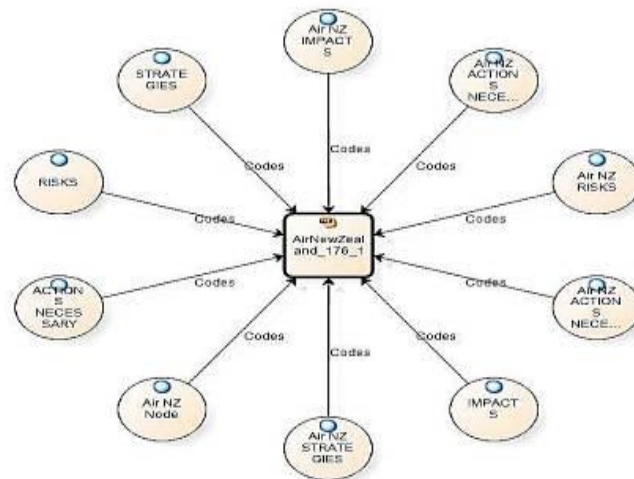


Fig. 4. Coding categories for the relationship between the nodes, research questions and Air NZ document

It is worth mentioning here that the significance of this qualitative analysis (or any documentary evaluation) is partly driven by evidence-based findings. Evidence, such as the emerged themes are convincing arguments regarding the existence of certain climate change phenomenon

or knowledge. Since knowledge is only true until it is disprove, post-positivists would argue that the documentary submissions and finding (above) evidenced climate change issues in NZ. Invariably, textual analysis is the key empirical material for developing a theory [38].

Furthermore, content analysis included thematic, linguistic, comparison and semiotics analysis. Thematically, data were meaningfully grouped together whereas semiotics proved useful in unravelling meanings through metaphor. Consequently, the cluster analysis of word frequency is indicative of categorisation of observations into two or more mutually exclusive *unknown* groups based on combinations of variables. The important factor here is that cluster analysis facilitated the organisation of words into groups where members of each group share common characteristics. Three groups were identified from the cluster tree or dendogram:

- Broad Group A: Policy, price, projections, reduction, risk, tax, time, term, trading, units, and vulnerable
- Broad Group B: Action, adaptation, agreement, business, carbon, change, climate, costs, development, economic, economy, emissions, energy, gas, global, government, impacts, and market
- Sub-group: Water, world, countries, developed, and liability

After clustering the dendogram by word similarity, Greenpeace and Air NZ form the first group while Business NZ forms the second group and Oxfam seems less important because it does not enter any group until near the end of the procedure. Comparatively, this suggests that there is better relationship and more coherence between Greenpeace, Air NZ and Business NZ submissions than that of Oxfam. However, this relationship could also be due to the low percentage coverage for Oxfam.

4. CENTRAL THEMES

While the framework matrix revealed several themes, only two of these and what each of the four submissions say about the primary nodes – strategies, impacts, risks, and actions necessary – are explored further.

4.1 Carbon Market Theme

- “It is more economically efficient and simpler for New Zealand Government to enter the international carbon market as a single purchaser” (Air NZ)
- “Consider the impact on the New Zealand economy and New Zealand households of any climate change policies, having regard

to the weak state of the economy, the need to safeguard New Zealand's international competitiveness, the position of trade-exposed industries, and the actions of competing countries” (Business NZ)

- “Enhanced leadership by the industrialized countries on emission reductions; incentives for developing countries to act, but without sacrificing economic growth or poverty reduction, and fully consistent with the principle of common but differentiated responsibilities” (Greenpeace)
- “Anything less than strong action by New Zealand domestically and in international negotiations will undermine our ‘clean green’ brand” (Oxfam)

4.2 Internationalisation Theme

- “The current, global, economic downturn is extreme (Air NZ)
- “Climate change is a global issue, it requires a global solution” (Business NZ)
- “This is a consequence of increased knowledge of the climate system and its interactions with other global systems and those interactions on human wellbeing” (Greenpeace)
- “We must take urgent international action - now- to reduce greenhouse gas emissions” (Oxfam)

It is clear that the four documentary submissions apparently agreed, in relation to the carbon market theme, that NZ should enter the carbon market as a single purchaser in order to ensure its international competitiveness. So it is that not only do the internationalisation theme's quotations appear to answer the research question, but one may also argue that there is a consensus among the four organisations suggesting collective international action in order to effectively address climate change problems. This main finding has two key implications for the study of Mpelasoka et al. [39]. First, it contrasts that of Mpelasoka which shows different regional responses to global climate models (GCMs). Second, Mpelasoka et al. [39] puts in that GCMs can hardly be directly employed in the development of desired climate change models due to their coarse resolution. Consequently, their study, including Sansom and Renwick's contention that changing risks of extreme rainfall are difficult to properly estimate using general circulation models [40], would benefit from the CAQDAS analysis.

WORD FREQUENCY RESULT

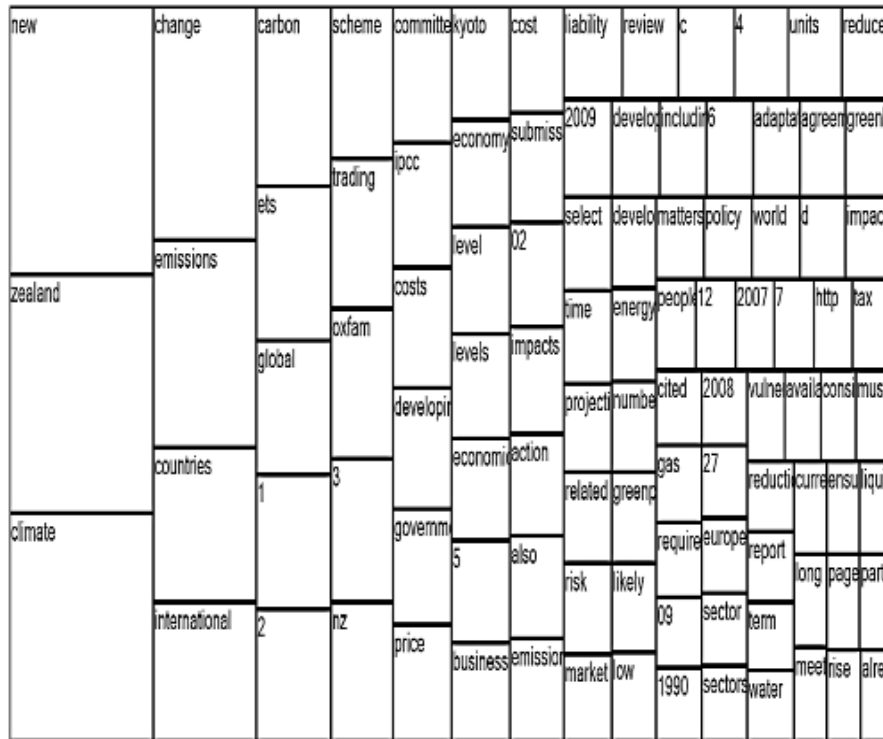


Fig. 7. Frequency tree map

Climate change commercial conditions costs countries new zealand developing emissions global government habitable happening impacts including increased industrial information ipcc island kyoto land level international nz obligations organisation oxfam people period position process projections reduce representation required result rise scheme sector social statement states support trading transfer travel

Fig. 8. Tag cloud depicting the most commonly occurring words

Climate Change uses impacts, climate process, climate change, and socio-economic development as its schematic framework for climate change indicators [41], it is not a coincidence that this analysis used impacts, strategies, risks, and actions necessary as the primary nodes.

5. CONCLUSION

This qualitative analysis examines four documentary submissions to ascertain how they answer the four earlier stated research questions. The analysed submissions – which

use relevant key rationales to buttress their arguments – validated the research questions which in turn helped in unravelling puzzles such as do Business NZ submission raise different concerns over climate change to those from Air NZ, Greenpeace and Oxfam? In relation to the research question, analysis shows that CAQDAS is quite useful for presenting visual representation of relationships, which partly led to the main finding. That is, there is a consensus among the four organisations that the international community must act in unison so as to effectively address climate change issues. CAQDAS ability to facilitate easy access to vast

amount of data that can be manipulated for coding and categorisation significantly enhances qualitative research. This paper seeks to assist qualitative researchers who may be considering NVivo 10 as a qualitative analytical method as well as facilitate public and corporate entities an avenue to express their opinions regarding climate change issues. While there is a risk of getting preoccupied with the data instead of the actual analytical interpretations, qualitative researchers with expert knowledge of NVivo can easily avoid this pitfall and produce structurally diverse descriptions of events.

In this regard, analysis revealed that there is consensus among the four organisations that the global community must act in unison in order to meaningfully address climate change issues. While the intents and expectations of the submissions were broadly similar, carbon market and internalisation are two of the main themes that emerged from cluster analysis. CAQDAS analysis shows that texts can be broadly grouped into three where members of each group share common characteristics. As a result, there is better relationships and more coherence between Greenpeace, Air NZ and Business NZ submissions than that of Oxfam. Considering that not every qualitative study can be premised on similar ontological and epistemological assumptions, this study can be exempted from holding to universal research rigour standard – although due consideration was given to secondary analysis issue during data processing. Critics may contend the generalisability of case study method. Such criticism, however, misunderstand the purpose of the present research project in the sense that its focus is on climate change issues and NZ ETS.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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