



# Understanding the geographic relationships between households and retail/services centres across Auckland's urban structure

Methodology and regional structure analysis

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# Understanding the geographic relationships between households and retail/services centres across Auckland's urban structure

Methodology and regional structure analysis

*Spatial efficiency in land use planning evidence base project*

August 2012

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## Executive summary

### Impact of urban structure on spatial efficiency for planning evidence base

The retail and household services sector is a major driver of urban form and how the city expands, with its spatial distribution having a large impact on travel and time efficiency for households (and indirectly, for businesses). Changes to urban form are shaped by a complex set of spatial interrelationships that occur *across* and *within* the urban economy. It is crucial therefore, that smart growth, centres-focussed planning approaches take account of the wider urban spatial economy and the role and function of local areas within it.

The geographic spending patterns of households across this urban spatial structure creates a picture of the spatial role of different areas within the urban economy. Understanding the role of the household sector across different centres and areas is key to determining the impact of different urban forms on households spatial efficiency, with the effective management of retail playing a core role in achieving the Auckland Plan land use strategic direction.

This report presents findings on the geographic influence of Auckland's retail and household services sector conducted as part of the Research, Investigations and Monitoring Unit (RIMU)-led *Spatial efficiency in land use planning evidence base* project. Specifically, it identifies the spatial role of retail/services areas in Auckland through patterns of spend (by origin and destination) in the interaction of household demand and supply across Auckland. This is key information for planners to understand the effects of centres/retail areas within the urban structure, travel impacts of these areas, and the characteristics of catchments that sustain centres. Specifically:

1. It provides a better understanding of the role of centres/areas within Auckland.
2. It illustrates how households currently meet their needs across Auckland's urban structure.
3. It provides an understanding of Auckland's urban structure and its relationship to household demand.

The project provides evidence on the effects of urban form for the Auckland Plan evidence base required under the Local Government (Auckland Council) Amendment Act (2010), integrating social and economic information on a spatial basis (Department of Internal Affairs, 2011). Rather than focussing on the effects occurring at the spatial boundaries of different land uses, it seeks to answer the larger planning question of understanding the impacts of urban structures on the ability of households and businesses to operate efficiently across the region – a core driver of economic growth and social well-being.

### Data and methodology

A large retail land use survey was conducted across 100 Auckland centres/areas, covering about three-quarters of Auckland's retail and hospitality sector (by employment). The survey frame was developed through a process of examining zoning maps, the household sector employment distribution, aerial photographs and existing work on Auckland centres classifications. Spend information by retail/services category was then obtained for each centre/area, and linked to approximately 3,500 household catchment areas across Auckland. This generated rich information

on exactly how and where Auckland households in each neighbourhood are meeting their needs across the 100 centres/areas.

An Auckland road network distance matrix and GIS tools were applied to this information to calculate the distance effects and spatial role of the centres, thus giving the geographical relationships between households and retail/services centres across Auckland's urban structure. Analysis was conducted to understand the operation of household demand across the regional urban structure in relation to the distribution of retail supply across this structure. That is, patterns of retail/services offering within the urban structure were identified, and understood in relation to the share and type of household demand they met.

## **Findings**

An urban structure was identified to include the city centre (1 centre), city centre fringe (3), sub-regional (8), major urban (28), minor urban (36) and rural/satellite (11) centres, and non-centre areas (8). A large amount of complexity and spatial heterogeneity exists within this structure, driven by the interrelationships between differentiation in local supply, household characteristics and the relationship to the wider spatial economy.

The employment size of centres/areas corresponds to their relative positioning within the urban structure. Larger centres typically have higher shares of employment in retail and account for a substantial share of the overall household sector employment. The city centre, city centre fringe and non-centre areas also have significant components of other non-household sector activity, which increases the spatial extent of their role through household spend occurring at the workplace. Food retail plays a core role in major and minor urban and rural/satellite centres, and hospitality employment is concentrated into centres, but plays a relatively smaller role in sub-regional centres and non-centre areas.

The distribution of spend activity in centres/areas somewhat corresponds to centre hierarchy, but deviation to this relationship occurs where the role and function of centre/area types emerged as a result of *type* of retail supply and geographical location relative to existing household travel patterns. At a regional level, minor urban centres had the smallest geographical catchments, with 80 per cent of their spend occurring within eight kilometres road network distance. Distance effects at this share of spend were largest for rural/satellite centres (26 kilometres) and the city centre (16 kilometres), with other centre/area types falling within 11-14 kilometres.

The largest shares of spend occurred in larger centres, with higher distance effect curves, which quantify and show the geographical scale of this effect. At a high level, these patterns of spend also reflect the household sector employment profiles of these centres, but different ratios of spend per employee occur within different centres and parts of the urban structure. Catchment sizes (as a function of road network distance) were broadly related to centre/area size, where the scale and scope of activity attracts customers across greater distances as well as the centralisation of supply. Again, variations exist within this pattern related to the role and function of a centre (from differences in supply) and their location relative to the overall spatial economy of the region.

While larger centres attract a larger volume of spend across greater distances, and smaller centres have lower shares of spend and lower distance effects, this does not necessarily correspond to the

total travel effect for households (and therefore, spatial efficiency). This is because of a frequency of trips relationship operating across this centre structure where households typically make more frequent trips for consumable/smaller goods to smaller centres, and fewer trips for larger purchases to larger centres. As such, these distance effects should be interpreted instead as defining the geographical extent of the spatial role of the centre. The impact of this on the spatial efficiency for households will be examined in a forthcoming working paper focussing on travel effects.

As well as differences in catchment sizes *between* centre/area types, differences occur *within* centre types between different spend categories. Food and liquor spend was most highly localised, followed by automotive, while medical services had the greatest distance effect. Part of this variation reflected the local demand share of the role of larger centres combined with their wider catchments in other categories. Greater variation in catchment sizes by category existed within minor urban centres, non-centre areas and rural/satellite centres, possibly with a greater influence of non-local demand on wider catchment variability.

### **Implications for planners and policy makers and next steps**

The greater complexity of spatial interactions across Auckland's urban structure has been identified in this report, contributing to a better understanding of the role of centres/areas within Auckland. This enables better decisions to be made for different types of areas within Auckland, through being cognisant of their role within the urban structure. Moreover, centre/area-specific information allows planning to reflect local conditions. This information is also a crucial input to understanding the potential impacts of any changes to the geography of the household sector, such as the development or expansion of a centre.

Households meet their needs across a range of different centre/area types (shown in this research) relating to both household demand and the economics of supply. These complexities in the spatial interactions of retail supply and household demand are vital inputs to developing effective smart growth or compact city planning approaches. It cannot be assumed that all needs can be met locally, however, more efficient configurations in the balance of activity across different centre types can be achieved (enabled through planning provisions of land and zoning).

Understanding how the regional urban structure functions is key to effective planning for local areas and policy development for different types of areas. This is because local areas are impacted by wider urban forces, and will respond differently to supply interventions or changes to the supply-demand relationship. Moreover, policy/strategy needs to understand the interrelationships of the urban structure with growth and household enablement (Resource Management Act 1991), to identify/evaluate effective policy recommendations with favourable outcomes.

Further analysis will occur particularly in relation to identifying the *travel* effects for households from different urban spatial structures. This is distinct to and the next step from identifying the spatial role of centres/areas. The frequency of trips and scale of purchases need to be considered concurrently to understand the overall impact on household travel and therefore, spatial efficiency. Part of the effect also occurs through the location of household growth and characteristics (e.g. density and household composition) of residential areas within the urban plane. These factors will be considered together in the next phase of the project.

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# 1 Introduction

## 1.1 Background and overview

This report presents findings on the geographic influence of Auckland's retail and household services sector conducted as part of the Research, Investigations and Monitoring Unit (RIMU)<sup>1</sup>-led *Spatial efficiency in land use planning evidence base* project. Specifically, it identifies the spatial role of retail/services areas in Auckland through patterns of spend (by origin and destination) in the interaction of household demand and supply across Auckland. This is key information for planners to understand the effects of centres/retail areas within the urban structure, travel impacts of these areas, and the characteristics of catchments that sustain centres. Effective management of retail plays a core role in achieving the Auckland Plan land use strategic direction. Therefore, it provides evidence for planning direction in Auckland in understanding and determining the effects of different urban forms.

A regional analysis of spending patterns within Auckland's urban structure by centre/area type is presented in this report. It focuses on identifying how the spatial structure of retail/household services operates across the region and the distance effects and interrelationships that govern the spatial role of centres/areas. It includes the methodology used to undertake primary field research and the combination with other tools and data sources to identify these spatial relationships. The information provided here is for the 2011 calendar year, but the establishment of this framework will enable subsequent analysis of changes in centres and the regional urban structure over time. A more in-depth analysis of the implications of these centre analyses is provided in a forthcoming working paper from this project on the travel effects and impacts on household spatial efficiency.

Retail and household services sectors are important drivers of urban form and therefore, spatial efficiency for households and businesses. Patterns of retail development typically follow patterns of household and business demand, transport infrastructure, employment areas, and are often opportunistic in location. In aggregate, many individual location decisions have a major effect on urban land use patterns.

The spatial structure of this sector is key to accessibility, enablement and amenity for households (Resource Management Act, 1991), and consequently urban efficiency and sustainability. Increasingly complex patterns of supply and demand of households across this structure mean it is crucial for planners to understand the spatial interactions and processes occurring within and around this sector.

## 1.2 Requirement for a planning evidence base

The Local Government (Auckland Council) Amendment Act 2010 states that Auckland Council must produce a spatial plan for Auckland (79) and that this must "provide an evidential base to support decision making for Auckland, including evidence of trends, opportunities, and constraints within Auckland (79)(4)(c)". The plan must also understand how growth is likely to occur (including for

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<sup>1</sup> The Research, Investigations and Monitoring Unit (RIMU) is Auckland Council's centralised research unit.

individual geographic areas (79)(4)(d)) and the supply of infrastructure, land and other investment to cater for this growth (79)(4)(b), (d) and (f).

A central government position paper *Developing an Evidence Base for the First Auckland Spatial Plan* states that “(t)he government considers it very important that the Auckland spatial plan is underpinned by a strong evidence base (Department of Internal Affairs, 2011: p2)” and that “(t)his means appropriate data, accurate interpretation of this data, and rigorous analysis techniques, contributed to by Government agencies as well as the Auckland Council (p2)”. Moreover, it states that “successful spatial planning is underpinned by a credible evidence base, which includes social, economic and environmental information from a range of sources, and *integrates this on a spatial basis* (emphasis added) (p5)”. This evidence is also to be expanded on an ongoing basis. The spatial interaction between household demand and household sector supply across Auckland is a key component of the integration of social and economic processes that need to be considered here.

A recent paper *Spatial Planning: Evidence and Evaluation* (Gardner-Hopkins and Fairgray, 2011) presented at the New Zealand Planning Institute 2011 *Winds of Change* conference highlights important shifts occurring within the Auckland spatial planning concept. These are “a stronger emphasis on the spatial nature of urban economies, and a requirement for stronger science to underpin future planning – the Evidence Base (Gardner-Hopkins and Fairgray, 2011: p0)”. It also highlights the greater linkages between the plan and the evidence base, and the robustness of the information within this; and that this focus on the effects of urban form has emerged over time through the court and planning processes.

Importantly, this paper argues that the evidence base should not simply focus on the distribution of activities and the interaction occurring at their spatial boundaries. Instead, it should focus on the spatial interactions that occur across the urban form *because of* the spatial distribution of activities. “The location of activity is a core influence on urban efficiency, sustainability, amenity and well-being, especially because of the cost and efficiency of spatial interactions (p3)”. This information is understood conceptually, but there is now an absence of technical evidence to understand the effects of different urban structures for the evidence base (Gardner-Hopkins and Fairgray, 2011).

### 1.3 Spatial efficiency in land use planning evidence base project

This project aims to evaluate the spatial efficiency of different types of urban structures for households and businesses. It provides crucial evidence for planning direction in Auckland to understand and demonstrate the effects of different urban forms. Specifically, it addresses the identified technical gap in understanding the impacts of urban structures. It analyses the effect of the urban structure distribution of land use<sup>2</sup> on the interaction of households and businesses across the region rather than just the interface between different land uses. This is a larger and more

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<sup>2</sup> Importantly, urban structure conceptually differs to land use per se. The former recognises the role of the land use distribution in generating the spatial relationships between the location of activities and the interactions that occur as a result - i.e. it understands how the distribution of land use operates as a structure. Meanwhile, the distribution of land use refers solely to the location of different activities without recognising the *impact of* location distribution.

important planning question in achieving a competitive city because it enables an understanding of how efficiently households and businesses can operate, which is a core driver of economic growth and social well-being.

The focus of this report is on the retail and household services sector and household demand. It presents and analyses data collected from the Council's retail land use survey and Marketview Ltd spend data purchased for the project.

Figures 1 and 2 below illustrate the work area structure of the *Spatial efficiency in land use planning evidence base* project and the positioning of this research within it. These represent the work areas only and not the linkages to other Council units or guidance input. The work area of this research is highlighted in Figure 2.

Figure 1. Macro structure of project - model of spatial efficiency in urban structures

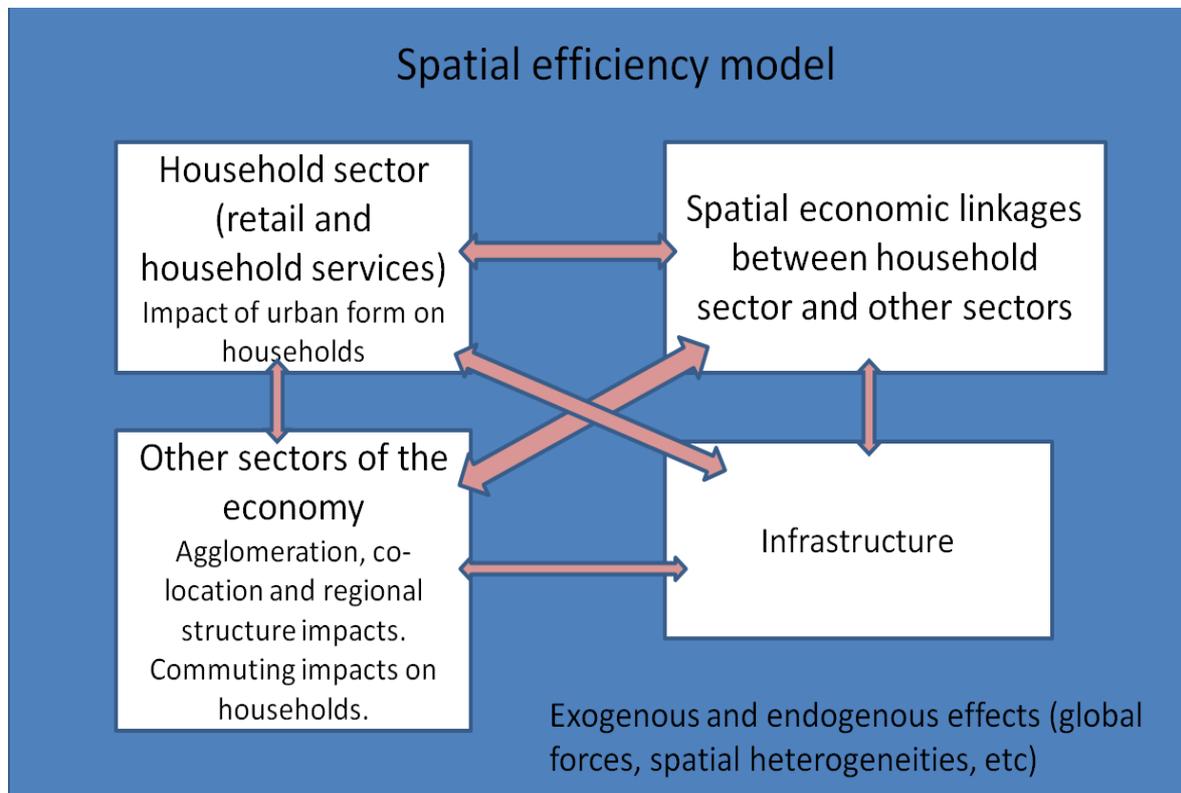
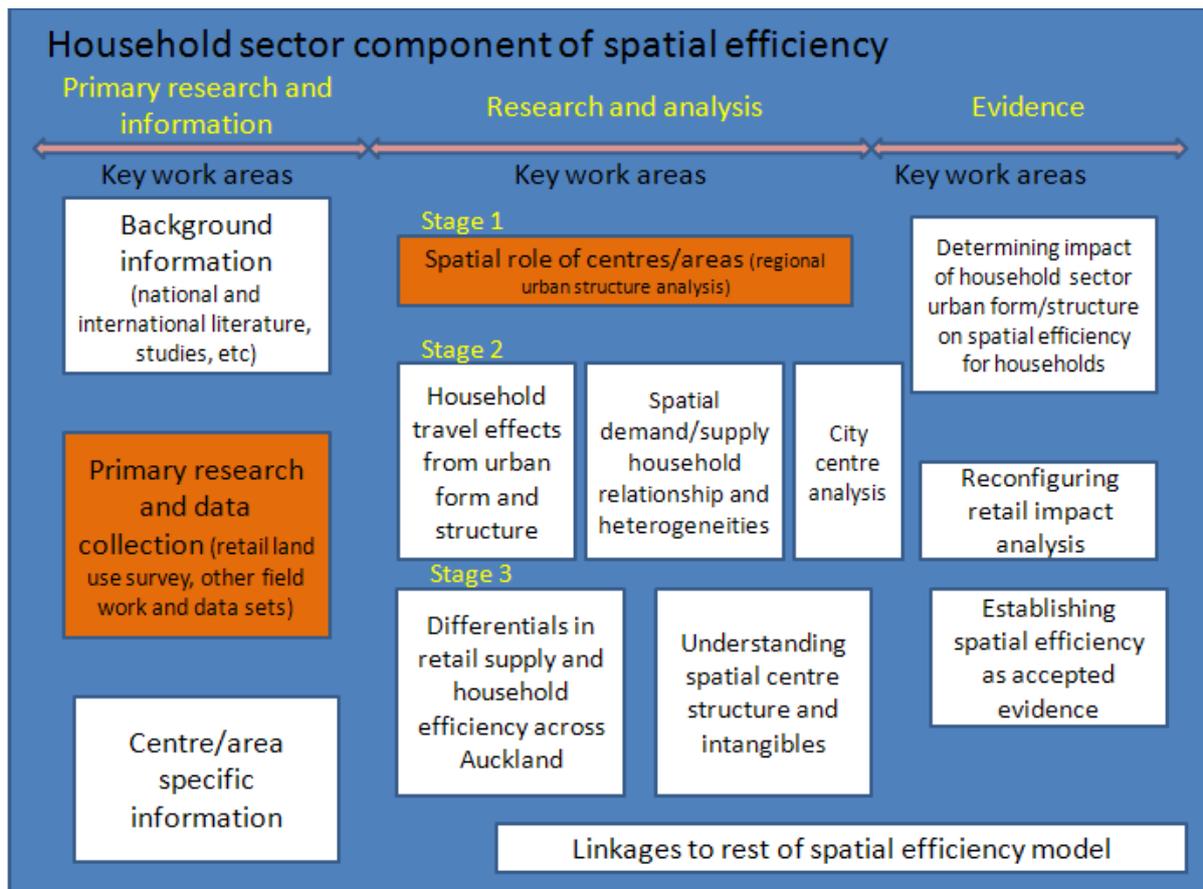


Figure 2. Work areas within the household sector component of the project



Sarzynski and Levy (2010) define spatial efficiency as:

“..the geographic arrangement of businesses and residences, the physical infrastructure that connects the region (i.e., transportation, communication, green space), and the orientation of each towards the other that minimizes the time, effort, or cost required to conduct economic activities for the entire metropolitan region(p4)”.

The above definition reflects the conceptualisation taken in this research, which will be further adapted as research progresses. Importantly, it differs to approaches taken where the most spatially efficient land use is determined through the activity willing to pay the highest price for the land. It is the author's view that a highest bid price approach could result in patterns of development where consumers are willing to trade off the ability to operate efficiently with access to larger land parcels (eg: residents wanting lifestyle blocks) or cheaper land (eg: factories locating outside of urban industrial zones). By definition, these are spatially inefficient structures where the ability/right to create these patterns is *bought* through purchasing/renting the land<sup>3</sup>.

These externalities partly occur through differences between social and private costs whereby consumers in many cases do not fully internalise their externalities of spatial inefficiency. Where externalities are in fact paid (such as through a development contribution that truly reflects the cost

<sup>3</sup> However, this is not to say that the market does not perform an important role. Rather, Council involvement in the planning for land uses is required to manage externalities that arise direct and indirectly across different time and spatial scales that an entirely market-led approach cannot account for.

of expansion), it is nearly impossible to distribute the benefits (payments) equitably across the rest of society who face the effects of the externality. It is often also not possible to even identify the true cost of expansion<sup>4</sup>.

#### **1.4 Implications for planners and policy makers**

The information presented from this stage of the project research provides important information for Auckland Council planners and policy makers in three main ways:

4. It provides a better understanding of the role of centres/areas within Auckland<sup>5</sup>.
5. It illustrates how households currently meet their needs across Auckland's urban structure.
6. It provides an understanding of Auckland's urban structure and its relationship to household demand.

The above aspects are critical components in understanding how the urban structure affects households in their ability to operate efficiently across the urban form.

#### **1.5 Structure of report**

This report is structured in the following way: It begins by briefly discussing the relationship between urban form, spatial efficiency and urban structures (section two). Section three describes the data sources used, including primary data collected in the field. Section four explains the methodology undertaken to analyse this data and combine it with other tools. Section five presents the results from this research on the spatial role of centre/area types within Auckland's urban structure for households. Lastly, section six provides concluding remarks on the implications for Council planners and policy makers.

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<sup>4</sup> Further research is currently being undertaken within this project on the conceptualisation of spatial efficiency.

<sup>5</sup> Centre/area-specific information is provided under a separate work area of this project (see Figure 2).

## 2 Brief discussion on urban form and spatial efficiency

Substantial change has occurred in urban structures of land use throughout the last century, driven by a combination of urban expansion, greater population mobility, demand for different land uses and global economic forces impacting on the local configuration of activity. Until more recently, this has broadly been seen as a shift from cities containing only one large core centre (monocentric) to urban structures containing several large sub-centres in addition to the core (polycentric) (Berliant and Wang, 2008). Earlier research conceptualises these sub-centre formations through the tendency of commercial activity to centralise away from the city centre as commuting costs increase, and the economics of land use in commercial node formation where commercial uses outbid residential activity (Davoudi, 2003; McMillen and Smith, 2003; Redfearn, 2007).

Planning approaches have concurrently encouraged the growth of suburban centres to enable needs to be met locally, thus reducing travel demand and its externalities. These are largely compact city development and smart growth strategies reliant on mixed land use (i.e. residential and commercial) development and the strengthening of centres.

However, it is becoming increasingly manifest that the shifts and changes to urban form are substantially more complicated than a broad movement to polycentric structures (Anas, et al., 1998); and the changes to this form arise from a set of complex spatial interrelationships that occur *across and within* the urban economy. Therefore, it is key that smart growth strategies also take account of the wider urban spatial economy and the role and function of local areas within this. Paramount is understanding how households and businesses operate across all areas and the impact of the urban structure in its entirety on their accessibility and enablement (Resource Management Act, 1991).

The retail and household services sector is a major driver of urban form and how the city expands. The spatial distribution of this sector also has a key impact on the travel and time efficiency for households through their ability to meet their needs (Buliung and Kanaroglou, P.S., 2006; Cervero and Duncan, 2006; Gjestland, et al., 2006)<sup>6</sup>. Therefore, it has both a direct and indirect impact on spatial efficiency for households as well as businesses. The emergence of different forms of retail/services and complexities within the wider regional structures is well documented (Borchert, 1998; Dale and Sjiholt, 2007; Guy, 1998; Birkin, et al., 2002)<sup>7</sup> and reflective of these shifts in urban form. The irregularities and differentiation within these structures also shows the greater spatial complexities and heterogeneities in the fundamental relationship between household demand and supply within this sector<sup>8</sup>.

The geographic spending patterns of households across this urban spatial structure creates a picture of the spatial role of different areas within the urban economy. Understanding the role of centres and areas is key to determining the impact of the urban form on households' spatial efficiency.

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<sup>6</sup> Research, such as that by Bento, et al. (2005) also examines the effect of household residential location relative to place of employment on travel demand for households.

<sup>7</sup> Research by Bourlakis, et al. (2009) also outlines growing complexities in electronic retailing and social media, but this is beyond the focus of this research as the focus here is on physical retail impact on household efficiency.

<sup>8</sup> It is not the focus of this report to provide a more thorough discussion on urban form here. More detailed information will be presented in a forthcoming working paper from this project and in Bergin (2012).

Moreover, observed or actual geographic patterns of household spend in many cases differ to the distance decay assumptions applied in the absence of this information (see section 5.3.1).

## 3 Data sources

### 3.1 Data used in analysis stages

This section outlines the different data sources that were utilised within each stage of the research and should be considered concurrently with the methodology to understand the conceptual approach. Data sources are presented in accordance to the stage in which they were used.

#### 3.1.1 Initial establishment of retail and household services areas (stage 1)

The following data sources were used in constructing the retail and household service areas in which to conduct the retail land use survey. These were used at both wider regional spatial scales to identify broader regional patterns of land use as well as at smaller spatial scales to identify the specific boundaries of retail/services areas.

- **District Plan zoning information.** Base layer zoning information was used to identify key areas of business zoned land. These layers were most effective for determining the extent of small to medium sized urban centres surrounded by residential land use, and were less able to identify clusters of retail/services within larger tracts of predominantly industrial/commercial zoned land (Auckland Council, 2011).
- **Aerial photographs from 2010 and 2011** were used to assist in the verification of spatial boundaries of retail/household services areas (Auckland Council, 2011).
- **Statistics New Zealand Business Demographic dataset.** This dataset contains counts of the number of employees and businesses within each meshblock by detailed industry sector. Information is collected annually, with the latest information available for this exercise as at February 2011. Data for household sectors were displayed spatially to identify concentrations of household sectors across Auckland (Statistics New Zealand, 2011). Table 1 shows the categories used within this dataset to define the household sector.

Table 1. Household sector activity classification captured in the retail land use survey

<b>E Construction</b> <i>Activities included in the frame from under this category included construction activities provided to households such as builders, residential buildings, and components (eg: kitchens/bathrooms) of buildings.</i>
<b>G Retail Trade</b> <i>All retail trade activities were included and "...includes units mainly engaged in the purchase and onselling, the commission-based buying, and the commission-based selling of goods, without significant transformation, to the general public." and "...generally operate from premises located and designed to attract a high volume of walk-in customers, have an extensive display of goods and/or use mass media advertising designed to attract customers (Commonwealth of Australia and Crown Copyright New Zealand, 2006: p69)".</i>
<b>H451 Cafes, restaurants and takeaway food services</b> <i>All activity under this classification has been included, and covers cafes and restaurants, takeaway food services (ready for consumption), catering services, pubs, bars and clubs.</i>
<b>I Transport, Postal and Warehousing</b> <i>Activities included in the frame from under this division include road, rail, water and air passenger transport, tourist transport (including sightseeing), postal/courier services, and storage services.</i>
<b>J Information Media and Telecommunications</b> <i>Activities included in the frame from under this division include movie cinemas, internet cafes, libraries and archives.</i>

<p><b>K Financial and Insurance Services</b></p> <p><i>Activities included in the frame from under this division include banks, insurance providers, and other branches of household oriented (determined in the field) financial services such as loan/finance companies, money transfer services, credit unions, financial investing services and mortgage brokers.</i></p>
<p><b>L Rental, Hiring and Real Estate Services</b></p> <p><i>Activities included in the frame from under this division include passenger car rental, rental/hiring of goods for domestic use, and real estate and other property management services.</i></p>
<p><b>M Professional, Scientific and Technical Services</b></p> <p><i>Activities included in the frame from under this division were those potentially providing a share of their services to households and were mainly architectural, engineering, legal, accounting and veterinary services.</i></p>
<p><b>N722 Travel Agency Services</b></p>
<p><b>O Public Administration and Safety</b></p> <p><i>Activities included in the frame from under this division were the local branches/public service centres of local and central government services.</i></p>
<p><b>P Education and Training</b></p> <p><i>Activities included in the frame from under this division included all educational providers (pre-school, primary-secondary school, post-school/tertiary, and other education providers), and excluded P822 Educational Support Services.</i></p>
<p><b>Q Health Care and Social Assistance</b></p> <p><i>All activities under this category were included in the frame and "...includes units mainly engaged in providing human health care and social assistance (Commonwealth of Australia and Crown Copyright New Zealand, 2006: p343)."</i></p>
<p><b>R Arts and Recreation Services</b></p> <p><i>All activities under this category were included in the frame and "...includes units mainly engaged in the preservation and exhibition of objects and sites of historical, cultural or education interest; the production of original artistic works and/or participation in live performances, events, or exhibits intended for public viewing; and the operation of facilities or the provision of services that enable patrons to participate in sporting or recreational activities, or to pursue amusement interests (Commonwealth of Australia and Crown Copyright New Zealand, 2006: p351)."</i></p>
<p><b>S Other Services</b></p> <p><i>Activities included in the frame from under this category were those providing household services including, personal services (hair, beauty, weight, brothels, etc), repair and maintenance (automotive and other), religious and other interest groups and services where private households could hire staff (eg: cleaning).</i></p>

### 3.1.2 Retail land use survey (stage 2)

Primary data was collected in the field from each survey area. This included the outlet name, outlet address and retail/household services category. Surveyors were also asked to collect information on ethnic indicators of outlets, by identifying whether they had (i) a non-English language displayed on the front of the store or signage, and (ii) whether the outlet name suggested a non-New Zealand European owner or merchandise/services.

### 3.1.3 Retail spend information (stages 2 and 3)

Data on retail spend for each merchant identified in the retail land use survey was purchased from Marketview Ltd. Spend information was supplied in aggregate at the centre or sub-centre level (and not at the merchant level) to meet privacy requirements. This included the value of spend and

number of transactions in each retail/services category from households in each centre for the 2011 calendar year. Spend and transactions information for each centre and category was also linked geographically to the origin household catchments across the region.

Marketview spend data includes all the New Zealand-based household electronic card spend (excluding cash out and ATMs) at store Eftpos terminals via the Paymark network. All of the data is obtained from each Paymark terminal, with approximately 70 per cent of merchants on this system. Therefore, this gives a good indication of the *quantum* of electronic spend going through the merchants. This data is combined with the BNZ electronic spend information, which occurs across all Eftpos terminals, and not just those on the Paymark network. Because BNZ customer spending patterns are representative of the patterns of all bank customers, their spend can be used to extrapolate the Paymark data across the rest of the network by comparing the ratio of BNZ electronic spend to other spend within the Paymark system. BNZ data also provides the customer origin (by 3-4 contiguous meshblock groupings for privacy), which is also representative of all electronic card customers. Therefore, this can be used to extrapolate spatially the customer origin of the total spend (Marketview Ltd, 2012).

Marketview data covers electronic spend only, and does not include cash purchases, hire-purchase or automatic payments. While this does not affect the geographic distribution of spend origin (as it can be assumed that non-electronic spend follows the same patterns of customer origin), it would have a disproportionate effect in some sectors. These are likely to include sectors characterised by smaller purchases such as cafes. There is potentially also some variation by area where a higher share of spend could occur as cash in some centres than others. In combination, these factors could create a margin of error when comparing the total spend between centres where centres could have a higher/lower share of cash spend depending on their retail/services mix and demographic profile<sup>9</sup>. International tourist spend data is also not included, although this is available separately from Marketview Ltd<sup>10</sup>.

#### **3.1.4 Application of spatial data linkages (stage 4)**

The distance matrix used to identify the travel and geographic effects of centres was calculated using the 2011 Auckland road network by the Statistics New Zealand 2006 meshblock boundaries. Road network distances were calculated from each origin meshblock centroid to each destination meshblock centroid.

Household numbers by meshblock from the Statistics New Zealand 2006 Census of Population and Dwellings (Statistics New Zealand, 2006) were used to convert household catchments in the distance matrix to household-weighted distances (see Appendix 3).

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<sup>9</sup> This will be investigated in greater depth as part of the *Spatial efficiency in land use planning evidence base* project through the construction of a spatial retail demand model where differences can be identified between the local household geographic spending profile (by sector) and the estimated household demand by sector.

<sup>10</sup> This has not been purchased as part of this research as the key focus is on the effects of the urban structure for Auckland households and businesses, as well as funding constraints. However, this data can be purchased using the retail land use survey field work survey frame.

## 3.2 Limitations

Several limitations exist within the data sources used in the analysis and are described below.

1. A progressive rounding system is applied to Statistics New Zealand Business Demographic data whereby meshblock employee counts are rounded to the nearest multiple of three (if below 1,000) or nearest 10 (if above 1,000). However, this does not affect the level at which employment structural trends are observed for centres in this analysis, but figures should be regarded as accurate to the nearest 10 employees. For further information, refer to [www.stats.govt.nz](http://www.stats.govt.nz).
2. Some inaccuracy is likely to occur during the retail land use survey where merchants are unable to be matched to an Eftpos terminal due to differences in trading and account names. However, all significant merchants within centres/areas were captured and the effect of these merchants is likely to be minor relative to the overall centre/area patterns. Spend information is also reported at higher levels of aggregation (i.e. to the nearest million or billion), which exceeds the likely impact of these omissions.
3. Spend data has been spatially extrapolated over BNZ customer locations. Further detail is provided in section 3.1.3.
4. Road network distances within the distance matrix reflect a household (population) weighted average of meshblock centroid distances. Slight variations may exist to actual distances, but these are likely to be less than the one kilometre intervals at which data is reported, and will in aggregate not result in bias.

## 4 Methodology

This section outlines the methodology undertaken in the research. It covers the following:

- The initial stages of interpretation of Auckland's urban structure to identify the fieldwork approach taken.
- The collection of primary data.
- The combination with other data sources.
- The application of distance and demand modelling in the analysis of the data
- The interpretation of the data.

As the key objective of this report is to provide information on the land use research collection process and presentation of findings on individual centres for planners, results and interpretation of the impact on Auckland's urban structure and spatial efficiency overall will be covered in greater depth in a separate working paper<sup>11</sup>.

### 4.1 Stage 1 – Defining retail and household services areas within Auckland's urban structure

The primary objective of this stage was to define spatially the areas of retail/services within Auckland from which to collect household spending information. It was imperative to conduct this process while conceptualising different urban structures and types of areas across which households meet their needs. Therefore, it considered each area/centre's positioning within the wider urban structure, rather than focusing on a retail area/centre in isolation from the rest of the urban system. Consequently, a regional retail hierarchy was inherently developed for the purposes of this analysis, including a range of different types of retail areas/centres as well as different sizes. This is crucial given that household demand and retail supply is differentiated within any urban structure, meaning different types of spatial interactions occur at different levels/areas within a framework.

Thus, the first activity within this stage involved gaining an understanding of the types of urban structures and their dynamics, alongside identifying the drivers and processes operating within the spatial economy, as well as their interconnectedness with the spatial economy. Scans of the international literature on urban systems and dynamics were undertaken by Bergin (2012)<sup>12</sup> and Donovan (2012)<sup>13</sup> as part of the *Spatial efficiency of land use planning evidence base* project<sup>14</sup>. As such, exploring the approach taken to develop a centres classification in the Auckland Plan (Auckland

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<sup>11</sup> This working paper is part of the *Spatial efficiency in land use planning evidence base* project.

<sup>12</sup> Bergin, K. 2012 *Spatial economic processes contributing to a spatially efficient city: A literature review and annotated bibliography*, Auckland Council Working Paper 2012/003.

<sup>13</sup> Donovan, P. 2012 *Modelling economic growth in the urban spatial structure: A synthesis and annotated bibliography*, Auckland Council Working Paper 2012/004.

<sup>14</sup> Urban structures and their effect on spatial efficiency are investigated in greater depth within the forthcoming spatial efficiency working paper.

Council, 2012) and other existing retail demand models provided an initial basis<sup>15</sup>. The classification used here differs to that of the Auckland Plan because it necessarily represents Auckland's urban structure as it currently operates, while the Auckland Plan recognises the longer-term future planned role of centres within the urban structure. However, the analysis is configured such that centres/areas within this classification can be re-aggregated as changes to the functioning of areas within the structure occur<sup>16</sup>.

The spatial distribution of retail/services and its (spatial) relationship to other sectors (i.e. the spatial economy) was evaluated in conjunction with establishing an urban structure. This was done through mapping the distribution of retail and other household sectors employment across Auckland from the Statistics New Zealand Business Demographic dataset<sup>17</sup>. Concentrations of retail/services were identified at a range of spatial scales. Appendix 1 shows these maps for metropolitan Auckland. These were then compared to district plan zoning maps to determine their correlation with zoning.

Once a broad centre/area structure was identified, each centre was examined individually to determine the precise boundaries of the centre. It was important this occurred at the meshblock<sup>18</sup> level so that data collected could be combined or compared to other data to create measures such as spend per employee, spend by floorspace areas, total employment, etc. that are available at the meshblock level. At this scale, zoning information and aerial photographs were used to determine the meshblocks included within the centre/area as meshblocks were too coarse to identify precise boundaries. The approach generally taken was to include a meshblock in a centre/area if it contained business zoned land as the remainder was typically residential, meaning that any meshblock employment statistics would predominantly correspond with the business zoned land and therefore, the spend data collected from merchants in the area. Figure 3 provides an example of this process.

The approach was also taken to define a centre based on its central trading area rather than any surrounding residential area, such as a walkable catchment, often included in planning boundaries for a centre. Multiple reasons underpin this methodology including:

- i. Wider centre boundaries can change according to political or other decisions, such as on the applicability of smaller/larger walkable catchments. Because centres are defined by the physical trading space, their applicability remains despite changes in the wider surrounding boundaries.

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<sup>15</sup> This included largely the Market Economics Ltd 2012 *Retail Demand and Supply Model* due to its current use (and therefore, consistency) within the Auckland Council and Market Economics Ltd 2011 *Auckland Growth Model*.

<sup>16</sup> As data is captured at the centre/area level, customised analysis can also be conducted currently to reflect different groupings of centres/areas. The framework has been designed to maximise use for planning demand within Council.

<sup>17</sup> The significant mapping work undertaken by Brian Osborne, RIMU, Auckland Council in the development of retail/services areas stage of this research is gratefully acknowledged.

<sup>18</sup> A meshblock is the smallest statistical division of land, corresponding approximately to the size of a city block. To some extent, meshblocks correlate with total numbers of households and businesses, meaning that meshblocks are geographically larger in less dense areas (such as rural areas) and smaller in higher density areas (such as the city centre). For further information refer to Statistics New Zealand ([www.stats.govt.nz](http://www.stats.govt.nz)).

- ii. The peripheral areas often included in centre definitions would have only a marginal impact on the economic activity information obtained from the centre. This applies to both surrounding residential areas as well as generally to surrounding industrial areas.
- iii. Often these peripheral areas have little correlation beyond walkability to the actual geographic role of the centre. The latter is typically much wider, and overlaps with other centre catchments as centres become larger.

This methodology had greater effectiveness in defining areas that were traditional centres or tightly spatially defined retail areas rather than broader areas of ad-hoc retail development, particularly within industrial precincts. Challenges in relating the role of these *types* of areas within the urban structure to a spatially bound definition of the area were also present. Similar challenges emerged in defining the spatial extent of retail development that has occurred on an ad-hoc basis along key transport network routes<sup>19</sup>.

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<sup>19</sup> Local knowledge from within RIMU was gratefully received in many of these instances.

Figure 3. Process of defining retail/household services centre meshblock boundaries



## 4.2 Stage 2 – Auckland retail land use survey

Stage two involved the collection of primary field data on the land use within each retail/services centre/area across Auckland. In total, 96 centres/areas have been included in this research, of which 70 have been surveyed<sup>20</sup>. The remaining 26 centres/areas had enough information (on merchants and their categorisation) already available through previous work so that surveying did not need to occur. Fieldwork was undertaken by RIMU, where surveyors visited each area identified previously in stage 1. Regional maps of these centres/areas are included in Appendix 2.

<sup>20</sup> The surveying of centres and subsequent data entering, coding and checking by many staff in RIMU is gratefully acknowledged.

The name, address and retail/services category was collected in the field for each merchant. Surveyors were asked to collect information for all merchants or businesses where the general public were able to purchase a good or service<sup>21</sup>. Therefore, this included factory shops or businesses whose operation was not primarily oriented toward providing goods or services directly to households, but had *some* direct sales activity. Spend figures are not inflated by this approach because only the household spend activity is picked up in the data purchased.

This survey frame also meant that all household sector activities were captured and not just retail. It was important to take this approach as retail is only one component of the role/function that a centre/area provides for households. Households also travel to centres/areas to access services<sup>22</sup> and hospitality functions<sup>23</sup>. As such, capturing all household functions of a centre/area is important to identify the role and functioning of a centre/area within the urban structure. Table 1 in section 3.1.1 provides a guide to the types of activity within the household goods and services sectors as defined by the Statistics New Zealand ANZSIC 2006 classification system.

Accuracy checking processes occurred to ensure consistency across all centres/areas as field information was collected by multiple surveyors and the activity structure and nature of centres/areas differed<sup>24</sup>. In total, nearly 12,000 merchants' were identified across the 70 centres surveyed<sup>25</sup>. Each entry was then coded to a formal industry classification using the Statistics New Zealand ANZSIC 2006 system<sup>26</sup>. The level of specification in classification varied by sector, where retail sectors were defined using the highest level of detail, while financial services (excluding professional services such as accountants and banking) were defined through broader categories. Businesses whose main function was as an intermediary or primary producer (rather than a household sector) were coded according to the function they served to households. This is because the household spend (and therefore, household access to the centre) at these businesses has occurred due to their function provided to households rather than their intermediary or primary producer role to other businesses.

Retail and services classification systems subsequently required further aggregation to ensure privacy and commercial sensitivities of merchants were not breached. Broadly, data cannot be released for a merchant type/category containing only one merchant. However, the detailed coding

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<sup>21</sup> This is similar to the definition by Guy (1998) "a retail outlet should normally store retail goods which can be sold to members of the public from the premises, without prior appointment (p255)". However, the 'without prior appointment' component has not been adopted as many services such as medical centres and lawyers constitute an important part of a centre/areas' function (i.e. households travel to the centre to access the service), but are not necessarily able to offer services without prior appointment.

<sup>22</sup> The role of professional services such as lawyers and accountants that bill by invoice or direct payment will be underestimated through the spend data as a large share of their direct household transactions do not occur through Eftpos.

<sup>23</sup> Centres/areas also play an important social role through the amenity functions, sense of place, community cohesiveness, etc. However, this falls outside the scope of this research and will be covered in greater depth within a different workstream of the project.

<sup>24</sup> Error checking occurred at several scales and included the accuracy of entries between the field sheets and data entered, consistency of the survey frame across centres, the spatial accuracy of entries and the retail/services classification.

<sup>25</sup> A larger number of potential merchants were identified in the field, but were reduced during the error checking process.

<sup>26</sup> The Australia New Zealand Standard Industrial Classification (ANZSIC) system is a multi-levelled activity classification system. For further information, refer to Statistics New Zealand ([www.stats.govt.nz](http://www.stats.govt.nz)).

of field information enables further breakdown of retail categories to occur. The spend categories currently obtained include 'automotive', 'core retail', 'food and liquor', 'hospitality', 'medical', 'other store types', 'other retail', 'personal services' and 'recreation'. Further work is underway to achieve higher levels of disaggregation through constructing a classification system that meets privacy and commercial sensitivity requirements for different sized centres/areas.

### 4.3 Stage 3 – Geocoding spend data to primary field research

Finalised field data was sent to Marketview Ltd who linked the electronic account information of merchants to primary data collected in the field. This geocoded the spend information by identifying the spatial location of merchants by centre/area (not previously defined), meaning that the location of spend taking place is known. The origin of customers and their spend is consequently also linked to the geographic destination of spend. Therefore, the combination of these two datasets means that:

1. For each centre, the level of spend within each category is identified as well as the geographic origin of that spend (i.e. the market catchment).
2. For each neighbourhood, the spatial patterns (by centre) of where households meet different needs (by retail/services category) is identified – i.e. how much of their spend within each category is going to which centre.

The combination of this information, with the process undertaken in stage one means that a picture can be created of the share of household needs met by different *types* of centres/areas.

### 4.4 Stage 4 – Calculation of distance effects of centres/areas

Stage four involved identifying the spatial role that centres/areas play for households within Auckland's urban structure. The first stage of this analysis displays the spend data spatially through a GIS system to understand the shape of catchments for each centre. This is important because catchment *shape* is only partially correlated with Euclidean (straight line) distance due to heterogeneities within the urban plane. It is thus broadly a combination of distance, spatial patterns of household demand, the relative location of other retail/service areas, the distribution of other sectors<sup>27</sup>, the layout of transport infrastructure, household characteristics impacting the demand for goods/services and consumer mobility and supply side factors for merchants (land, zoning, etc). Furthermore, these interactions occur at different spatial scales, meaning that the shape of catchments are impacted both at a broad level and more specifically where spending patterns of households are sometimes driven by highly localised geographies.

The *share* of a centres/areas spend from each household catchment area was displayed through a GIS system using a graduated colour scale to show the distance gradients in spend, creating the catchment shape. These were constructed separately for each centre/area using consistent colour graduations by share of spend, enabling comparisons of geographic *scale* and *shape* to be made

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<sup>27</sup> Both the viability of development patterns and the household spend that occurs at the workplace.

between centres. For example, smaller centres/areas typically have higher geographic concentrations of spend, while larger centres/areas are sustained by larger catchments.

The geographic *shape* and *scale* of centres/areas needs to also be considered alongside the quantum of spend to understand the overall role of centres for households. This is because although some centres play a large spatial role (i.e. households travel over large distances to access them), their overall contribution to household needs may be small and therefore, have only a small impact on household resources. Frequency of access is also a key component determining overall travel effect where frequency of visits is often inversely proportional to centre size - households make many shorter trips to purchase smaller consumable items and travel greater distances less frequently to make larger purchases on durable goods. However, the quantification of total travel effects is outside the scope of this paper and will be the focus of a forthcoming working paper from this project.

The geographic shape and scale of centres/areas catchments identifies the spatial pattern of the role the centre/area fills for households. It is also paramount to identify the aggregate distance effects to accurately compare the spatial role of centres/areas for households. This has been conducted through applying a distance matrix to spatial patterns and quantum of household demand to each centre.

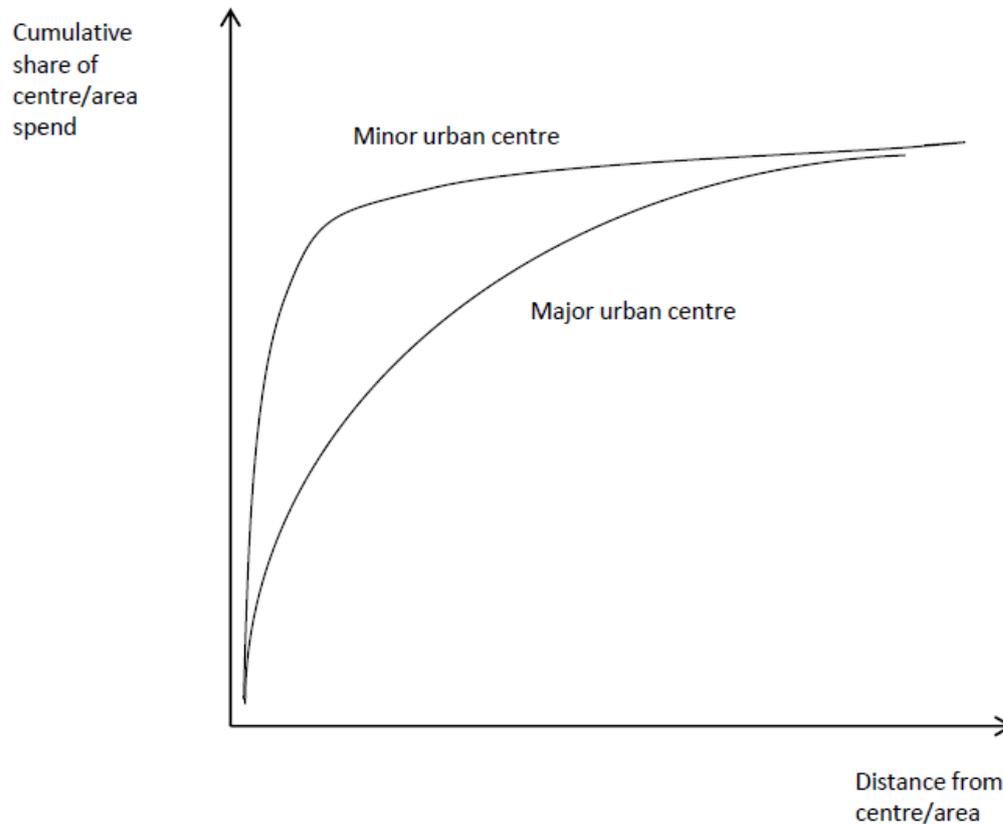
The distance matrix described in section 2 (i.e. road network distance between each pair combination of meshblocks in Auckland) was transformed into a matrix that identified the road network distance for each centre/area midpoint to each household catchment (as well as the ability to calculate future/other centres). As household catchments are constructed from groupings of 3-4 contiguous meshblocks, the average distance to all meshblock centroids within the household catchment was calculated, then weighted by the relative distribution of households by meshblock within the household catchment. The aggregated meshblocks forming household catchment spend origins are displayed for metropolitan Auckland in Appendix 3.

The spend from each household catchment in the centre/area was then aligned to the road network distance to the centre/area via the distance matrix. This gives a spatial profile of spend by distance, thus identifying the distance effect of the centre. Spend from each household catchment was then ranked by distance, and a cumulative spend by distance curve was generated for each centre (see Figure 4), showing the aggregate distance decay effect<sup>28</sup> of the centre. Curves were constructed for each retail/services category to identify whether the centre/area plays a different spatial role for households for different functions.

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<sup>28</sup> The distance decay effect along a straight line would appear much stronger due to the quadratic relationship between distance and area (see section 4.3.1).

Figure 4. Cumulative spend by distance curves by centre type



These curves enable comparisons of the geographic role between centres/areas and centre/area types. They are also key to understand the likely effects of new retail/services developments, changes in the size of centres/areas relative to household demand and changes in household demand. Irregularities within curves (in urban areas) suggest the influence of heterogeneities within the urban plane, such as a significant structural road network connection.

The application of a distance matrix is key to understanding the travel effects of centres on households. In calculating these effects, it is important to account for the following factors:

- (i) Trip frequency.
- (ii) Household spend that occurs at the workplace.
- (iii) Household spend occurring during travel.
- (iv) Multipurpose shopping trips.

It is beyond the scope of this report to calculate the travel effects for each centre, however this is explored in greater depth in a forthcoming working paper from the *Spatial efficiency in land use planning evidence base* project. The information presented in this report does however, provide an indication of the likely roles of centres through comparing their cumulative spend distance curves to

the regional average curves for the centre/area type. This is because the fundamental relationship between household demand and retail supply holds, but is influenced by where these interactions occur – i.e. the retail/services supplied within a centre correspond to patterns of household demand accessing that centre. Utility sought by households relative to resources used to access the utility, in combination with competition in supply, means that for trips originating from the household, the distance decay effect still largely holds. Therefore, large variations to regional averages suggest either qualitative variation in supply, higher shares of household spend occurring from the workplace or the location of a centre/area on a main transport node/route, increasing the share of trade occurring during travel. The distribution of households and their characteristics also impacts upon the shape of this curve.

## 5 Results

This section begins with a regional overview of results from the key stages before providing a detailed breakdown for each individual centre.

### 5.1 Construction of a retail and services area classification

Centres and other retail/services areas were broadly positioned within the following framework:

- City centre
- City centre fringe centre
- Sub-regional centre
- Major urban centre
- Minor urban centre
- Rural/satellite centre
- Non-centre area

At the outset, areas were defined as either centres or other areas based on a range of factors, predominantly including the presence of a retail/services core, the ability to access a range of goods and services outlets through walking within blocks of similar land use (i.e. not retail/services scattered among industrial land)<sup>29</sup> and the Auckland Plan. Areas that were seen as urban centres were classified under the hierarchy of city centre, sub-regional, major urban and minor urban, based mainly on a combination of the total size of their household sectors and core retail sectors. This hierarchy broadly corresponds to expected catchment sizes from the size and activity mix of the centres. Centres were also identified within the city centre fringe and were assigned a separate classification 'city centre fringe' given the likely substantial influence of proximity to the city centre on their overall retail/services offering. Centres that were located outside of the main urban area were identified as rural or satellite centres as they are likely to have different geographic scales of operation from serving largely rural catchments.

Other areas falling outside this centres classification were categorised as 'non-centres'. These were predominantly industrial or commercial areas that lacked a strong spatial differentiation between retail and other activity, or a discernible retail/services core. The distribution of these centres and areas by this classification system is displayed in Table 2.

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<sup>29</sup> The spatial structure of centres is being considered at a more detailed level within another workstream of this project.

Table 2. Classification of retail/services areas and centres in Auckland

<b>City centre (1)</b>			
<b>City centre fringe centres (3)</b>			
Eden Terrace	Parnell	Ponsonby	
<b>Sub-regional centres (8)</b>			
Albany	Manukau Central	Newmarket	
Botany	Mt Wellington/Sylvia Park	Takapuna	
Henderson	New Lynn		
<b>Major urban centres (28)</b>			
Airport	Highland Park	Mt Albert	Panmure
Birkenhead	Howick	Northcote	Papakura
Browns Bay	Hunter's Corner	Onehunga	Remuera
Eden Valley	Kingsland	Orewa	Royal Oak
Glen Innes	Mangere	Otahuhu	St Lukes
Glenfield	Manurewa	Otara	Westgate
Greenlane	Milford	Pakuranga	Whangaparaoa
<b>Minor urban centres (36)</b>			
Avondale	Green Bay Shops	Meadowlands	St Heliers
Balmoral	Grey Lynn	Mission Bay	Stoddard Road
Blockhouse Bay	Hauraki Corner	Mokoia Road Shops	Sunnynook
Clendon	Kelston	Mt Eden Village	Takanini
Dawson Road	Lynfield	Mt Roskill	Te Atatu
Devonport	Mairangi Bay	Papatoetoe	Te Atatu South
Eastridge	Mangere Bridge	Pt Chevalier	Three Kings
Ellerslie	Mangere East Village	Royal Heights	Titirangi
Glen Eden	Meadowbank	Sandringham	Torbay
<b>Rural/satellite centres (11)</b>			
Clevedon	Matakana	Silverdale Village	Warkworth
Helensville	Pukekohe	Waimauku	Wellsford
Kumeu/Huapai	Silverdale LFR	Waiuku	
<b>Non-centres (8)</b>			
Albany industrial	Constellation Drive Home Zone	Lunn Ave	
Archers Road	Lincoln North	Wairau Park	
Barry's Point Road	Lincoln Road		

## 5.2 Employment distribution by urban classification system

The geographical areas captured in the land use survey (section 4.2) contain 301,000 of Auckland's 627,000 employees (48%). The shares captured within the retail and hospitality sectors were higher at 78 per cent (47,000 employees) and 74 per cent (21,000 employees) respectively. Part of this effect comes about through targeting high spatial concentrations of retail/services activity, and partly through the tendency of these sectors to agglomerate into centres or other retail areas. However, a significant share of this employment (24%; 21,000 employees) occurs outside of these areas in other smaller centres/areas or dispersed throughout the region. A full breakdown of activities and the share of employment in each captured in this framework is provided in Appendix 4. Over half (51%; 134,000 employees) of the employees in the remaining household sectors were also within this framework.

The distribution of retail and household services employment by centre/area type within the framework is displayed in Table 3. Nearly one-third (29%; 20,000 employees) of the retail and hospitality employment is contained within sub-regional centres, and over one-quarter in major urban centres (27%; 18,400 employees). Both these centre types contain a much higher share of the total retail employment (34% and 28% respectively) than hospitality (20% and 24% respectively) or their share of total<sup>30</sup> employment (21% and 20% respectively). This partly reflects the focus of larger centres on core retail, particularly in centres that contain malls or privately owned shopping complexes. Core retail also typically concentrates into these centre types as it requires larger catchment areas, and therefore, centralised provision.

The remaining retail/services and hospitality employment is located in the city centre (14%; 9,700 employees), minor urban centres (12%; 7,900 employees), non-centre areas (9%; 6,100 employees), and the city centre fringe centres (4%; 2,600 employees). Within this, differences also emerge in the relative shares of retail vs. hospitality employment, where the city centre and city centre fringe has a much higher share (27% and 7% respectively) of hospitality employment than retail (8% and 2% respectively).

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<sup>30</sup> Total here refers to the employment captured within this urban framework rather than the regional total, i.e. it is how this employment is distributed within the framework.

Table 3. Employment composition of centre/area types within the survey frame, 2011

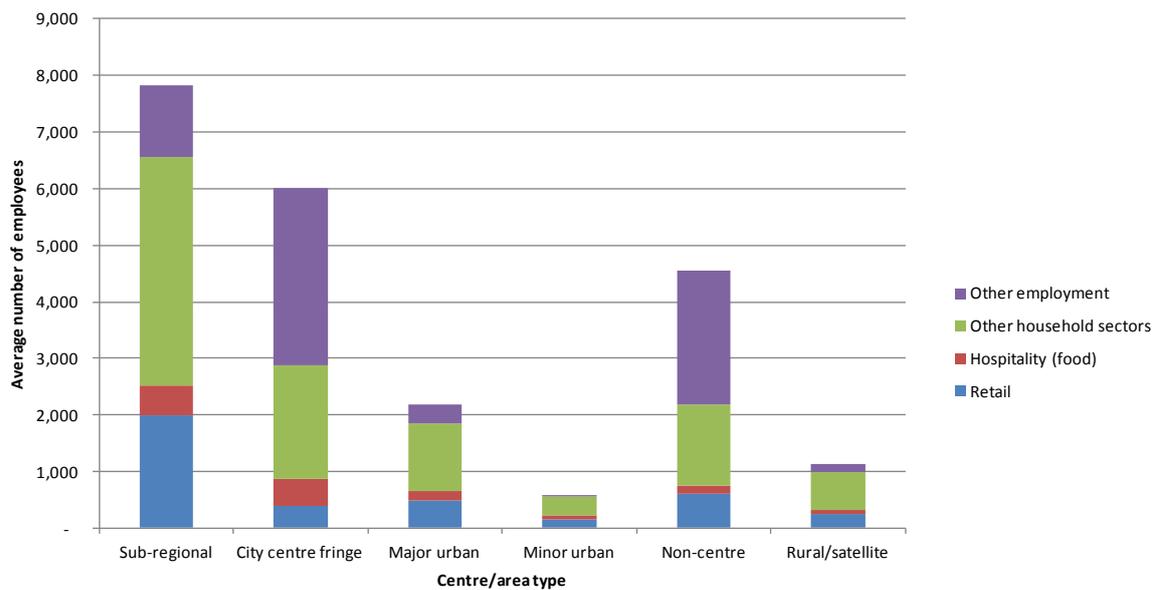
Centre/area type	Total retail	Total (food) hospitality	Household sector		Total household sectors	Total employment
			Total retail and (food) hospitality	Other household sectors		
<b>City centre</b>						
Employment	3,900	5,800	9,700	30,800	50,300	<b>89,400</b>
Share of survey total	8%	27%	14%	23%	19%	<b>30%</b>
Share of centre/area total	4%	7%	11%	35%	56%	<b>100%</b>
<b>City centre fringe</b>						
Employment	1,200	1,400	2,600	6,000	11,200	<b>18,000</b>
Share of survey total	2%	7%	4%	5%	4%	<b>6%</b>
Share of centre/area total	6%	8%	14%	34%	62%	<b>100%</b>
<b>Sub-regional</b>						
Employment	15,900	4,200	20,100	32,300	72,500	<b>62,600</b>
Share of survey total	34%	20%	29%	24%	27%	<b>21%</b>
Share of centre/area total	25%	7%	32%	52%	116%	<b>100%</b>
<b>Major urban</b>						
Employment	13,300	5,100	18,400	33,400	70,200	<b>61,500</b>
Share of survey total	28%	24%	27%	25%	26%	<b>20%</b>
Share of centre/area total	22%	8%	30%	54%	114%	<b>100%</b>
<b>Minor urban</b>						
Employment	5,200	2,700	7,900	12,500	28,300	<b>20,500</b>
Share of survey total	11%	13%	12%	9%	10%	<b>7%</b>
Share of centre/area total	25%	13%	39%	61%	138%	<b>100%</b>
<b>Non-centre</b>						
Employment	4,800	1,300	6,100	11,300	23,400	<b>36,400</b>
Share of survey total	10%	6%	9%	8%	9%	<b>12%</b>
Share of centre/area total	13%	4%	17%	31%	64%	<b>100%</b>
<b>Rural/satellite</b>						
Employment	2,800	800	3,600	7,300	14,600	<b>12,600</b>
Share of survey total	6%	4%	5%	5%	5%	<b>4%</b>
Share of centre/area total	22%	7%	29%	58%	116%	<b>100%</b>
<b>Survey area total</b>						
Employment	<b>47,000</b>	<b>21,300</b>	<b>68,400</b>	<b>133,800</b>	<b>270,500</b>	<b>301,000</b>
Share of survey total	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
Share of centre/area total	<b>16%</b>	<b>7%</b>	<b>23%</b>	<b>44%</b>	<b>90%</b>	<b>100%</b>
<b>Auckland total</b>						
	<b>60,500</b>	<b>28,900</b>	<b>89,400</b>	<b>261,700</b>	<b>440,500</b>	<b>627,100</b>
<b>Survey area share of Auckland</b>	<b>78%</b>	<b>74%</b>	<b>76%</b>	<b>51%</b>	<b>61%</b>	<b>48%</b>

Data source: Statistics New Zealand, 2011 *Business Demographic dataset*.

Figure 5 shows the average total employment size of each centre type or area, and the average size of employment in each sector within this<sup>31</sup>. The distribution of total size here necessarily reflects a hierarchical structure among centres as this was the basis for classifying these areas. It is the relative quantum of employment in each activity type that differs between centres, related not only to the centres/areas position within the hierarchy, but the wider role and function of the centre/area.

<sup>31</sup> The city centre has been excluded from this graph in order to highlight the differences within the rest of the urban structure, which are not clear due to the impact of the city centre's large size on the graph scale.

Figure 5. Average employment size and composition of each centre/area type, 2011



Data source: Statistics New Zealand, 2011 *Business Demographic* dataset.

The city centre, city centre fringe and non-centres have large average employment in other sectors (i.e. non-household sectors). This is likely to have a significant impact on the *type* of retail/services within these centres where a higher share is likely to be sustained by household spend occurring at the workplace rather than household trips to the centre. If only the employment in the household sectors is considered, no clear pattern exists by centre/area size in relation to the quantum of employment in the retail/hospitality sectors vs. other household sectors. At face value, this would appear to contrast earlier statements where core retail agglomerates into larger centres. However, the absence of a trend by centre size from this analysis is explained through relative trip frequency and share of household spend in those sectors. Of note however, is the smaller size of hospitality employment in the city centre and city centre fringe relative to the rest of the household sector.

Figures 6 and 7 illustrate these patterns further through identifying (i) the *share* of household sectors employment by activity *within* each area/centre type, and (ii) the *share* of each sectors employment *across each* centre/area type. Large differentials exist within this structure, partly reflecting general demand and supply principles of a central place hierarchy. Broadly, the following observations can be made:

- The city centre has a large household services and education role.
- Supermarkets and grocery stores play a large role in minor/major and rural/satellite centres<sup>32</sup>.
- Rural/satellite centres have a much broader mix of retail/services as these centres typically meet a wider range of household needs than a similar sized urban centre.

<sup>32</sup> The role of supermarkets are likely to extend beyond their contributed share of employment as they typically act as anchor stores sustaining retail activity in co-locating stores.

- Core retail (i.e. clothing, footwear and personal accessories; electrical and electronic goods retailing; and department stores) make up a large component of the role of larger urban centres.
- Hospitality plays a larger role in the city centre, city centre fringe, major and minor urban centres than other area types.
- Non-centre areas have a greater share of their activity in larger goods categories (automotive retail and services; hardware, building and garden supplies retailing; and furniture, floor coverings and textile goods retailing)
- Sub-regional centres have a focus on core retailing (clothing, footwear and personal accessories retailing; department stores; electrical and electronic goods retailing; and furniture, floor coverings and textile goods retailing).

Figure 6. Share of household sector employment within each centre/area type by activity, 2011

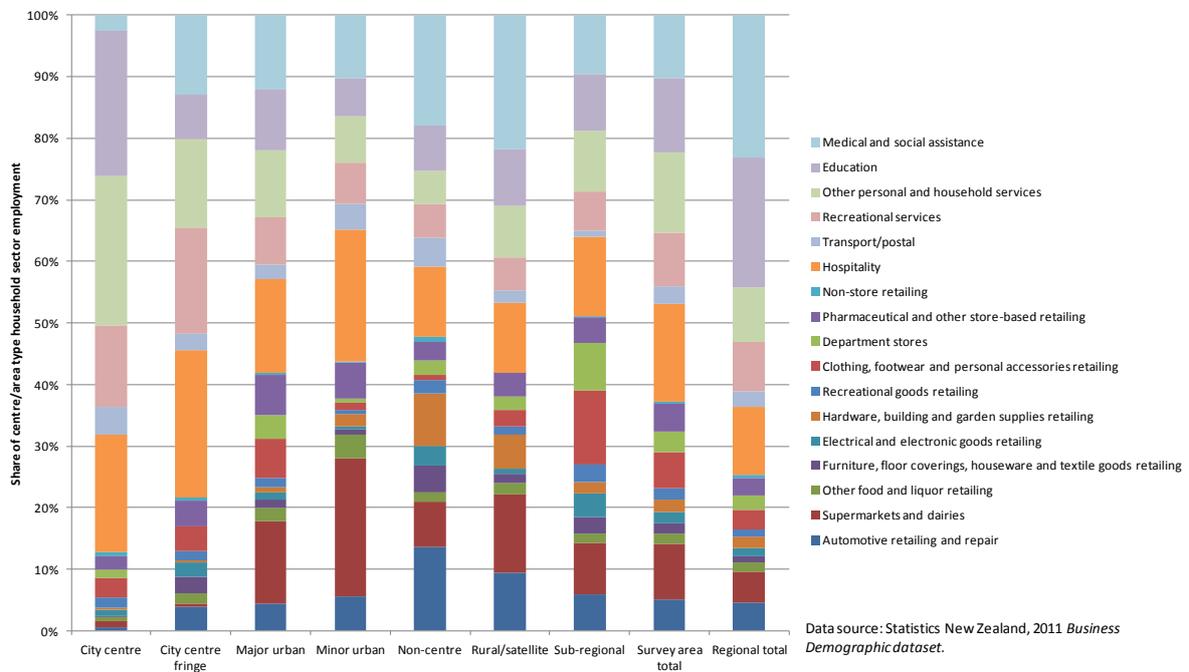
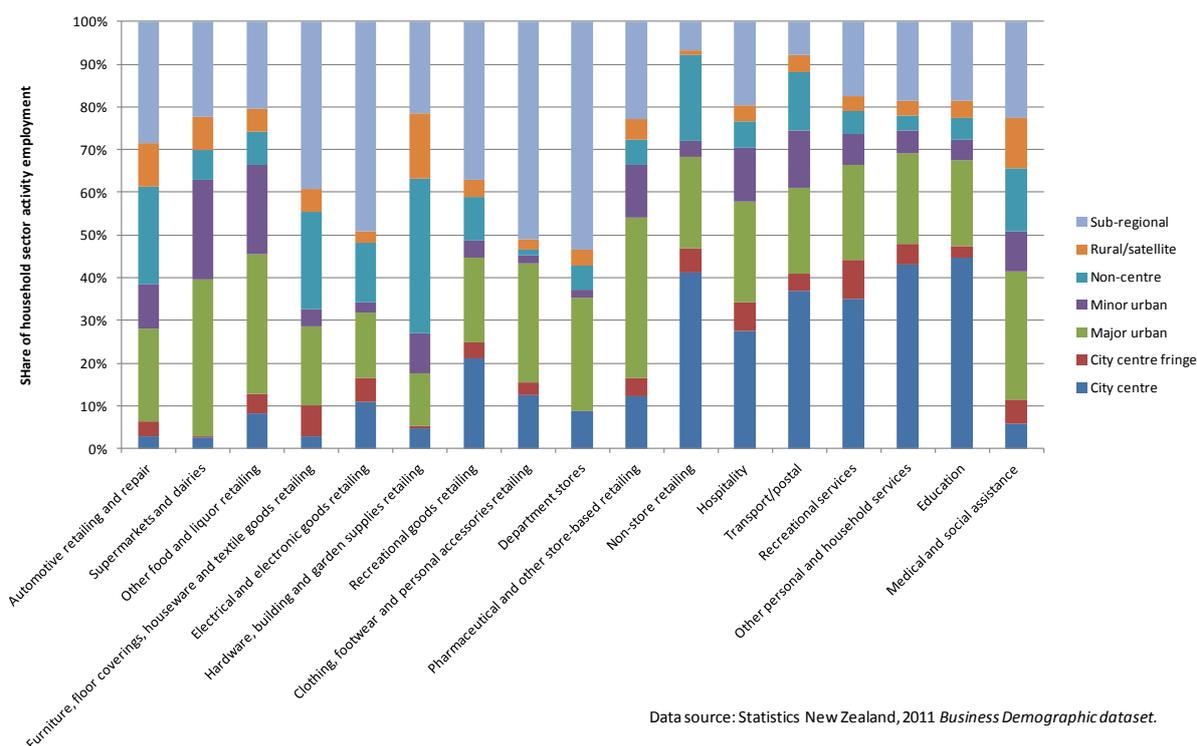


Figure 7. Distribution of each household sector activity by centre/area type, 2011



Data source: Statistics New Zealand, 2011 *Business Demographic dataset*.

## 5.3 Spend distance profiles by centre/area type and retail/services category

### 5.3.1 Spend distance profiles by centre type

This section examines the average distances travelled to different types of centre/area, which is an important indicator of catchment size. Generally, larger centres/areas are expected to have larger catchment sizes through the scale and scope of activity attracting customers across further distances. Other retail formats such as large format retail (LFR) which operate through larger centralised stores also typically have larger catchment sizes, as well as rural/satellite centres.

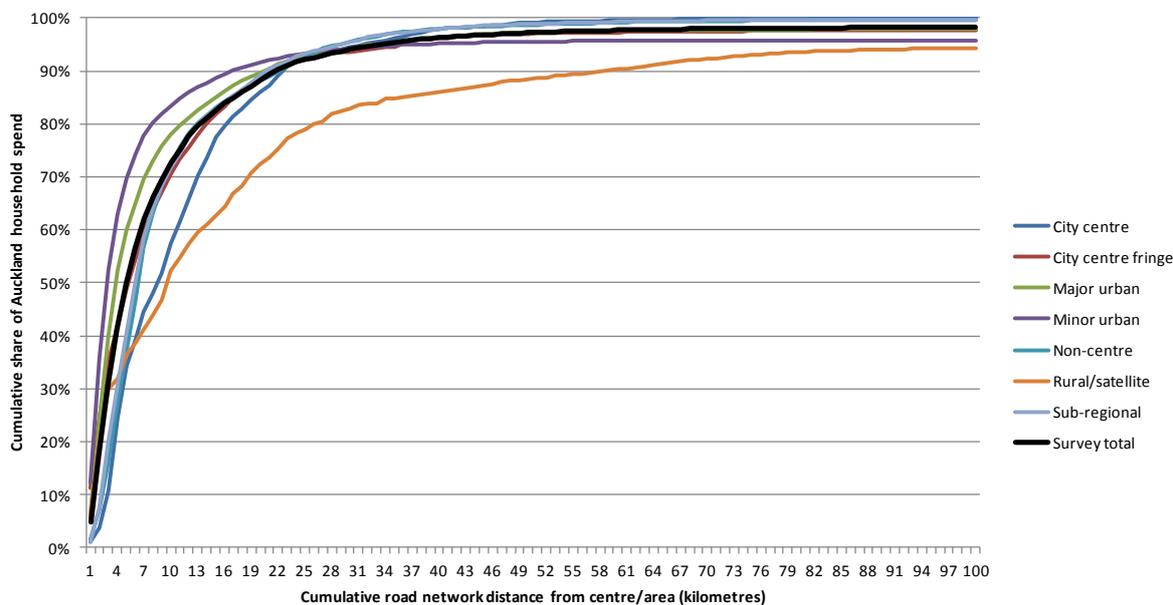
Figure 8 displays the cumulative share of spend with increasing distance from the centre, where each curve represents a different centre/area type. These curves are regional averages for all centres/areas<sup>33</sup> within each type. The road network distance at selected intervals of cumulative household spend is also displayed in Table 4. As expected, it shows that minor centres have the smallest catchments, with 80 per cent of spend occurring from households within eight kilometres road network distance of the centre<sup>34</sup>. Major urban centres have the next smallest catchment sizes,

<sup>33</sup> Regional averages have been calculated from the total spend within each distance interval to a centre/area type rather than the average of each centre/area types individual curves. This has been done to account for differences in centre sizes.

<sup>34</sup> The use of an 80<sup>th</sup> percentile occurs for comparative purposes between centres/areas to show the level of concentration/dispersal of spend rather than a definition of the catchment boundary. Rather, this research considers the centre catchments as a function of distance decay where the contribution of households to a

with 80 per cent of spend occurring within 11 kilometres. Accordingly, sub-regional centres have 80 per cent of their spend occurring within 13 kilometres, and the city centre within 16 kilometres. City centre fringe centres and non-centre areas have similar distances, containing 80 per cent of their spend (14 and 13 kilometres respectively) to sub-regional centres (13 kilometres).

**Figure 8. Cumulative share of Auckland household spend by centre/area type with cumulative road network distance, 2011**



Data source: Marketview Ltd and Auckland road network distance matrix.

**Table 4. Road network distance (kilometres) containing cumulative shares of Auckland household spend, 2011**

Centre/area type	Cumulative share of Auckland household spend			
	50%	60%	80%	90%
City centre	9	11	16	23
City centre fringe	6	8	14	21
Major urban	4	5	11	20
Minor urban	3	4	8	17
Non-centre	7	8	13	22
Rural/satellite	10	14	26	56
Sub-regional	6	8	13	21
<b>Survey total</b>	<b>5</b>	<b>7</b>	<b>13</b>	<b>22</b>

Data source: Marketview Ltd and Auckland road network distance matrix.

Within these urban areas, a higher share of the spend in the city centre and city centre fringe areas is likely to be sustained by household spend occurring at the workplaces as well as household trips to the centres, seen in the high non-household sectors employment component in Figure 5. However, the catchment sizes for household retail/services trips and centre employment are likely to differ,

particular centre/area becomes smaller with distance and catchments between centres overlap – i.e. it considers the full extent of household impact in relation to the relative contribution.

with the latter being geographically larger<sup>35</sup>. This effect is more evident in the city centre fringe curve where it is initially steeper, perhaps reflecting the local component of the centre role. This can be seen where 50 per cent of the spend occurs from households within six kilometres of these centres<sup>36</sup>, compared to six kilometres for sub-regional centres, and seven kilometres for non-centre areas.

Rural/satellite centres have considerably larger catchment sizes given the lower density of households in rural areas. This can be seen where 80 per cent of spend occurs within 22 kilometres. The local geographic role of these centres for households living within the immediate urban area that often surrounds these centres can also be seen where 60 per cent of the spend falls within 12 kilometres of the centre.

It is important not to confuse these distance effects with distance *decay* functions, as the latter is instead a component of the distance effect curve. A distance decay curve is the drop-off in household spend in a centre as distance increases away from the centre. This is a two-dimensional concept where the level of spend from a household in a centre is determined from a function of its distance from the centre. This means that if a two-dimensional cross section were taken as a radii from the centre, then distance decay effect would appear considerably stronger. This is because the increase in area, and therefore households, occurs at a greater rate than the linear increase in distance along the road network<sup>37</sup>.

Both of these are important components to consider in planning for centres and households. A distance decay curve identifies the likely role of a centre for a household given its distance from the household. However, if this were applied to a centre to determine the contribution of households at a certain distance from centres, then it would underestimate the importance of more distant households in sustaining the centre. This is because area increases with distance (see footnote 37) and therefore, in aggregate, these households have a greater effect than shown by a two-dimensional distance decay curve. As such, a distance effect curve captures this aggregate demand.

### 5.3.2 Auckland household spend by centre type

This section considers the distribution of Auckland household spend by centre type. It is important to note that only household spend that occurs within these study areas is captured and therefore, this analysis represents the distribution of household spend by these centre/area types within the urban structure<sup>38</sup>.

In total, there was \$11.3 billion worth of electronic card spend (from here on referred to as spend) at these centres by Auckland households. Figure 9 shows the largest shares occurred at major urban

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<sup>35</sup> This effect is likely to be stronger for these areas given the high share of employment in the higher value-added tertiary services sectors. These sectors have stronger tendencies to concentrate from their greater returns to agglomeration, meaning less dispersal across the region, and therefore, wider labour pool catchments.

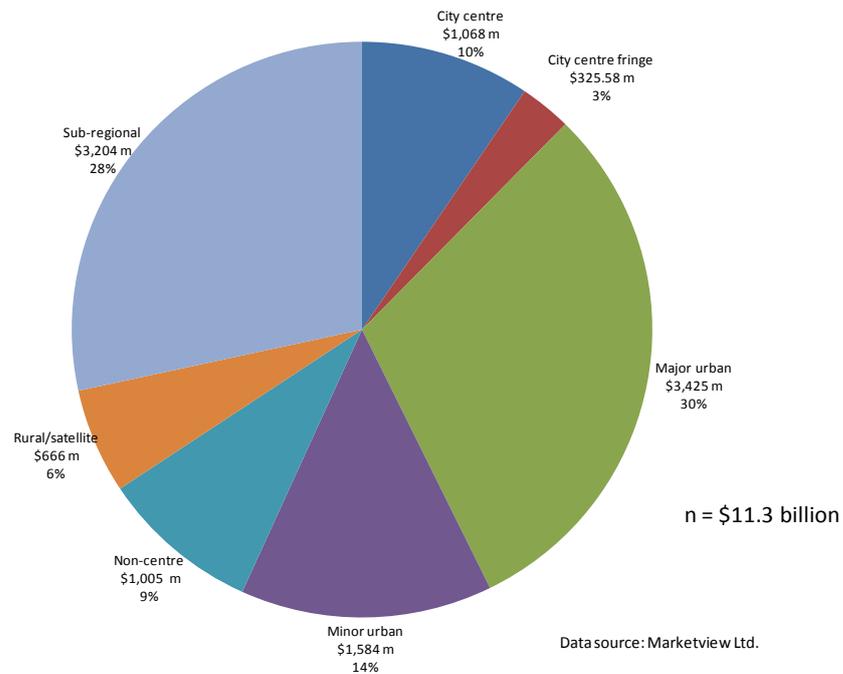
<sup>36</sup> At a higher level of detail (i.e. 100 metre intervals), differences exist for the 50 per cent of spend share between city centre fringe centres and sub-regional centres.

<sup>37</sup> This can generally be seen where  $\pi r^2$  (the area of a circle) is a quadratic, with the same principle applied to the surrounding residential area to a centre/area. Further detail on this effect is provided in a forthcoming working paper from the *Spatial efficiency in land use planning evidence base* project.

<sup>38</sup> A forthcoming paper from the project will provide further information on total spend by household catchments and the share occurring outside of these centres/areas.

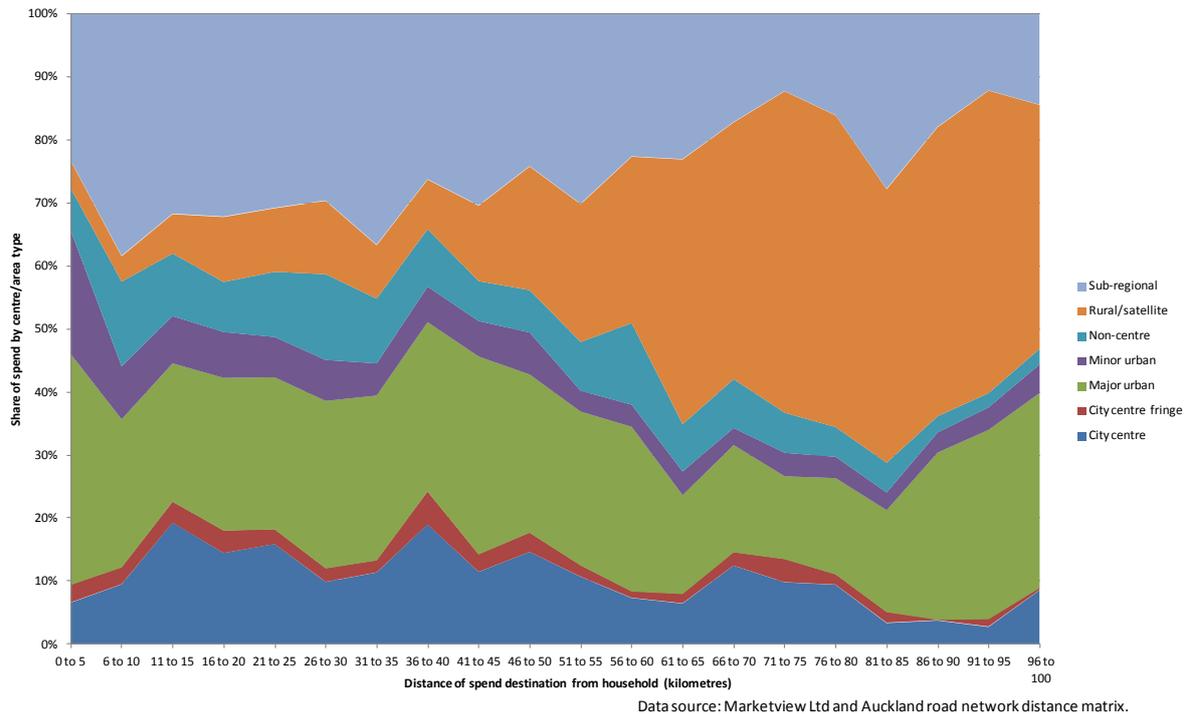
(30%; \$3.4 billion) and sub-regional centres (28%; \$3.2 billion). The remainder occurred in minor urban centres (14%; \$1.6 billion), the city centre (9%; \$1.1 billion), non-centre areas (9%; \$1.0 billion), rural/satellite centres (6%; \$666 million) and city centre fringe centres (3%; \$326 million).

Figure 9. Distribution of Auckland household electronic spend by centre/area type within survey frame, 2011



The share of spend by centre/area type varies with distance, which is directly related to the distance effect curves of each centre/area type. The distribution of household spend across different centre/area types at increasing distance from households is shown in Figure 10. This assists in disentangling the local role of these centres from their wider regional role. A share of their activity will be sustained by local spend, having the same function for local households as minor urban centres elsewhere, with the concurrent role of a larger urban centre for more distant households.

Figure 10. Distribution of Auckland household electronic spend (within survey frame) by centre/area type with distance from household spent, 2011



At a local level (i.e. within the 0 to 5 kilometre distance interval), the largest share of household spend occurs in major urban centres (37%), followed by sub-regional centres (23%) and minor urban centres (20%). The share of spend in minor urban centres drops sharply beyond this distance interval, showing the highly localised effect of these centres. Large variance exists in the share of spend by centre/area type with distance across most other centre/area types if the distance profile is examined in its entirety. Upon closer examination, the effects of different centre/area types begin to dominate at different distance intervals, that correspond to their distance effect curves. For instance, sub-regional centres account for the highest shares (30%-38%) of household spend at distances of six to 35 kilometres, followed by major urban centres (22%-27%) within this distance interval. Rural/satellite centres appear to dominate spend occurring across greater distances, due to their role as a rural urban hub where distances travelled to shop are necessarily greater. Other centre/area types display less clear patterns.

### 5.3.3 Spend by category and centre type

Patterns of spend by category differ by centre/area type. Figure 11 shows the composition of spend by centre/area type, giving an indication of the role of different centres<sup>39</sup>. The following patterns can be broadly observed:

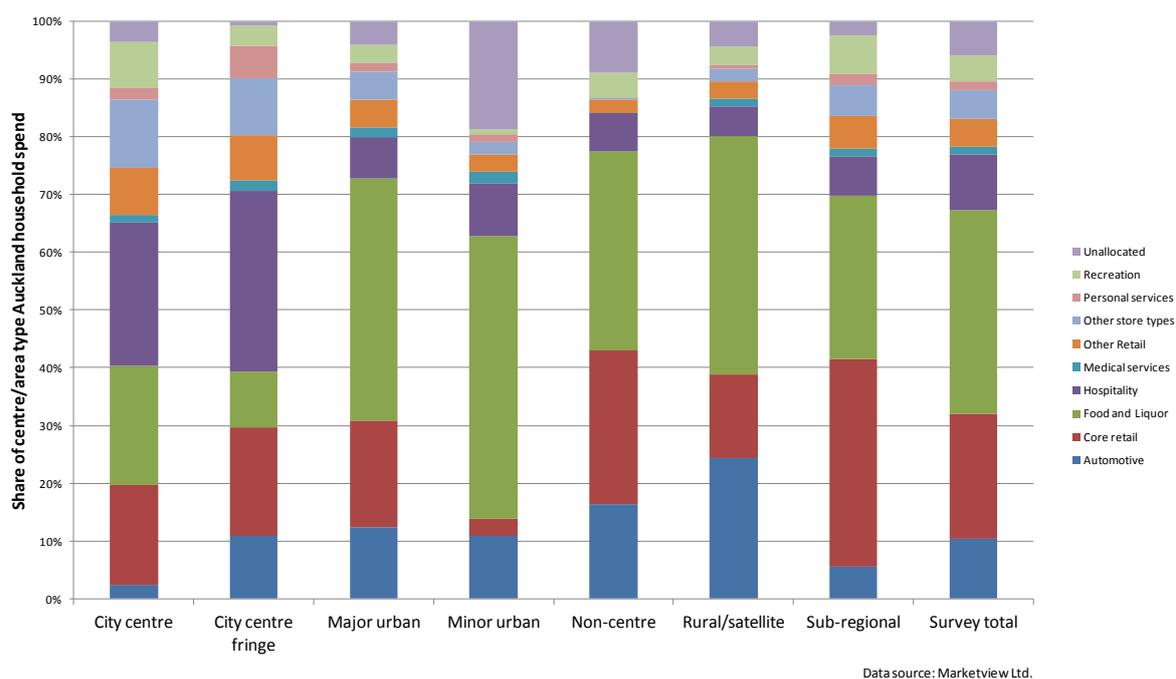
- The city centre has spend across a broad range of categories, reflecting the diversity of activity supported as a larger centre. It also has a significant hospitality spend component (25% of city centre spend), despite having a similar share of *employment* in this sector to the centres/areas as a whole.
- The city centre fringe centres have an even higher share of their spend in hospitality (31%), though this is also reflected in higher shares of employment in this sector. Both these centres and the city centre have lower shares of spend (10% and 21% respectively) in food and liquor than that of centres/areas overall (35%). Part of this effect is likely to be driven by supermarkets, which would comprise a lower relative share of activity in these areas. This is also reflected in the low share (3%) of supermarket and grocery stores employment in these areas.
- Food and liquor retail makes up a much higher share of spend in major urban (42%) and minor urban (49%) centres, reflecting both the role of supermarkets and grocery stores in these centres, and other food retailing. This is also seen in the regional share of food retailing employment in these centres.
- The high concentration of spend into food retailing of minor urban centres reflects the role of these centres in providing daily consumable household needs. Little comparison shopping occurs here, seen in the lower share of spend (3%) on core retail.
- Sub-regional centres have a high share of their spend in core retail (36%), illustrating their role as centralised retail hubs where the supply of comparison or durable goods tends to centralise into these centres.
- Core retail also comprises a significant share of spend (27%) in non-centre areas. These areas also have high shares of their spend in food and liquor (34%) and automotive retail/services (16%).
- The distribution of spend by category in rural/satellite centres illustrates their role for rural households<sup>40</sup> where spend is concentrated into core household needs (i.e. food and liquor – 41% and automotive – 24%), as well as having a significant component (15%) of spend on core retail. This is expected where these centres are likely to perform a similar role to minor and major urban centres within urban settings.

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<sup>39</sup> A share of spend within each centre/area type is unallocated to a spend category meaning that there were insufficient numbers of merchants to provide a breakdown by category. This should be taken into account when considering the structure of spend in centres. The effect is greatest in minor urban centres where fewer merchants exist in each category as a consequence of centre size. Spend in the unallocated category is most likely comprised of non-food and liquor and non-hospitality sectors (given their nearly universal coverage in the raw data), meaning that the scale of other spend categories is also likely to be underestimated.

<sup>40</sup> This is one component of the role of these centres, where some also serve a significant share of demand from households passing through the areas to other destinations.

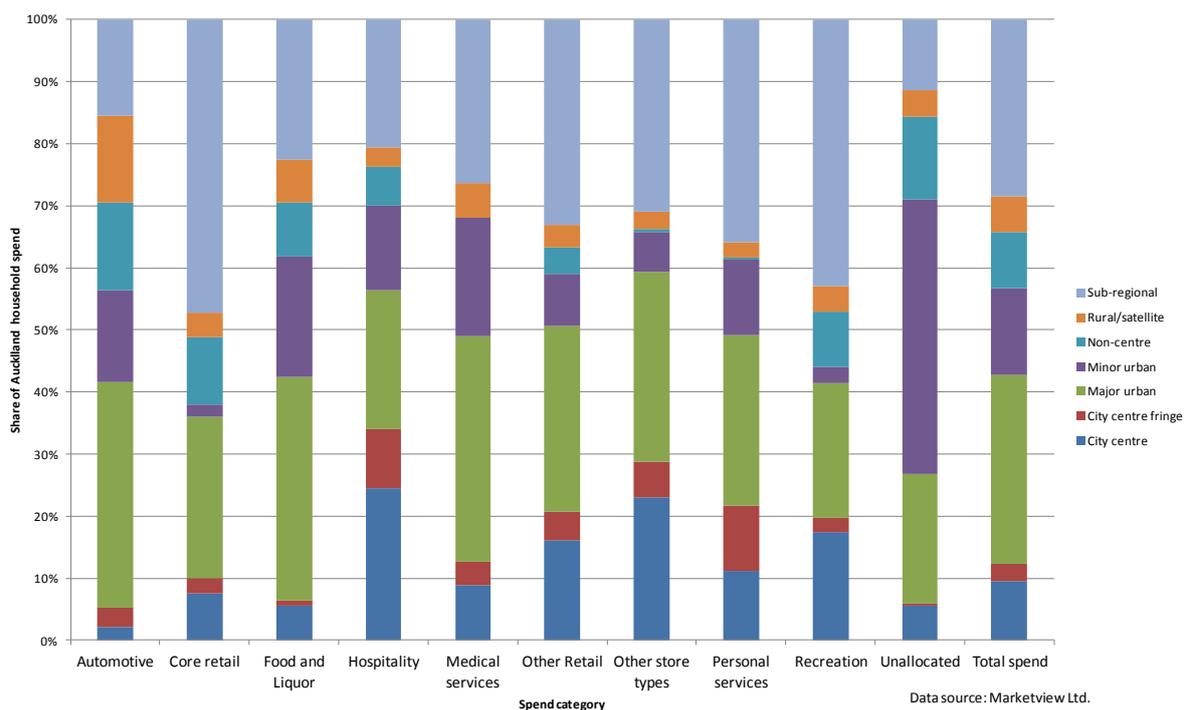
Figure 11. Distribution of Auckland household spend by category within each centre/area type, 2011



Patterns of spend in different retail/services categories should also be considered in the distribution of spend across (in addition to within) different centre/area types. This is displayed in Figure 12, with the key observations outlined below:

- Automotive spend tends to be concentrated into major urban centres (36%), but with disproportionate shares occurring in non-centre areas (15% compared to 9% of overall spend) and rural/satellite centres (12% compared to 6% of overall spend).
- Nearly half (47%) of core retail spend occurs in sub-regional centres, with a disproportionate share (14% compared to 9% of overall spend) occurring in non-centre areas. Other retail, personal services and recreational services also have higher shares of their spend occurring in sub-regional centres, than the share of spend occurring in these centres overall. A large share of core retailing (26%) also occurs in major urban centres, although this is below the share of spend (30%) occurring in these centres overall.
- Over half (55%) of the food and liquor spend occurred in major and minor urban centres, reflecting their role in meeting local consumable needs.
- Hospitality, other store, other retail and personal services have disproportionate shares of spend occurring in the city centre and city centre fringe. The city centre also attracts a disproportionate share of spend in the recreation sector (17% compared to 9% of spend overall).
- The local role of minor urban centres can be seen through attracting disproportionate shares of food and liquor, hospitality and personal services spend. A higher relative share of medical services spend also occurs in minor urban centres, but this does often relate to their general catchment areas, with households travelling over greater distances to access these services.

Figure 12. Distribution by centre/area type of Auckland household (survey frame) spend in each category



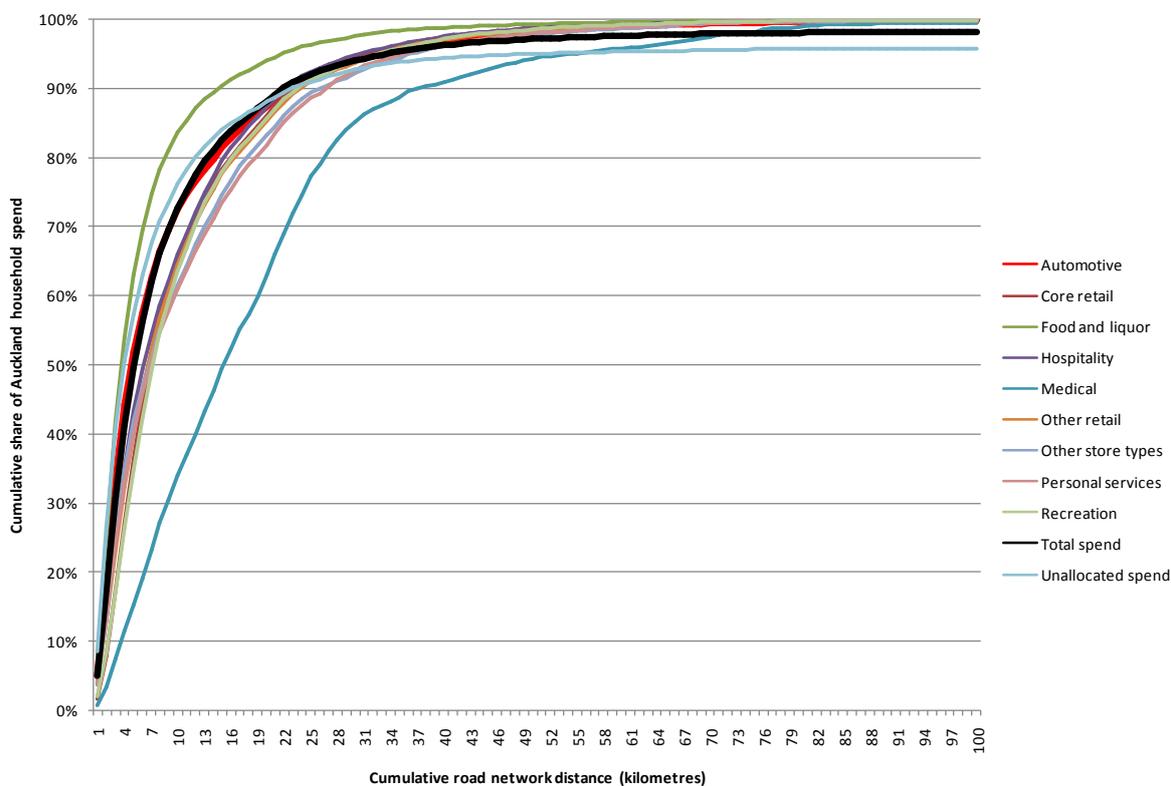
### 5.3.4 Distance profiles of spend by category

Sections 5.3.1 to 5.3.3 identify the distribution of spend in each category by centre/area type, as well as the distance effects of different centres/area types. This section considers these factors in combination to illustrate the distance effects of different components within centres, as well as the overall nature of sectors (i.e. across what distance households access different types of goods/services)<sup>41</sup>.

Figure 13 and Table 5 show the distance between households and spend destinations for each type of retail/services category. It is expressed as the distance to households by cumulative share of spend. The overall distance effect of each retail/services category broadly reflects the spatial distribution of supply. Categories with lower distance effects tend to reflect a more geographically dispersed retail offering, where households meet a greater share of their needs locally. This can be seen in the distribution of these sectors within the urban retail structure where they typically have higher shares of spend occurring in minor or major urban centres. The overall distance curve for each goods/services category is also influenced by its distribution *across* the retail urban structure. Larger centres with correspondingly larger catchments also contain a share of activity that occurs in smaller centres where consumers travelling further into a larger centre for other goods may also purchase items (multi-purpose shopping) that could also be purchased locally.

<sup>41</sup> This differs to the distance households *travel* to access the goods/services due to household spend that occurs at the workplace and multipurpose shopping and instead represents the distance between households and the destination of spend, which can be seen as the distance effect.

Figure 13. Cumulative Auckland household spend by distance for each spend category, 2011



Data source: Marketview Ltd and Auckland road network distance matrix.

Table 5. Road network distance (kilometres) containing cumulative shares of Auckland household spend, 2011

Spend category	Cumulative share of Auckland household spend			
	50%	60%	80%	90%
Automotive	5	7	14	23
Core retail	7	9	16	23
Food and liquor	4	5	9	15
Hospitality	6	9	15	22
Medical services	16	19	27	36
Other retail	7	9	17	24
Other store types	7	10	18	26
Personal services	7	10	19	27
Recreation	8	10	16	23
<b>Total</b>	<b>5</b>	<b>7</b>	<b>13</b>	<b>22</b>

Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 13 shows that food and liquor retail has the smallest distance effect seen where its curve falls furthest to the left. It shows that a higher share of this component of centres is sustained by local demand where 80 per cent of the spend in this category occurs from households living within nine kilometres of the spend destination. This corresponds to Figures 11 and 12 where a disproportionate share of this spend occurs in minor and major urban centres, with nearly half of minor centre spend

in this category. Supermarkets and main household grocery shopping trips are likely to drive a large part of the localisation effect. The relative strength of this effect to other sectors is strongest in the city centre and major urban centres, and weaker in the city centre fringe.

The automotive sector has the next smallest distance effect where 80 per cent of the spend occurs from households within 14 kilometres, and 60 per cent within seven kilometres. This also corresponds with the high share (51%) of this sectors spend that occurs within major and minor urban centres. However, this sector shows it is important to consider all sections of the spend curves where it begins to flatten out slightly (relative to other sectors) beyond approximately 85 per cent of spend. This aligns with the high share of this spend (29%) that occurs in rural/satellite centres and non-centre areas, which have characteristically larger distance effects (Figure 12).

Medical services have the largest distance effects seen in the significant rightward positioning of the curve. Sixty per cent of its spend is from households within 19 kilometres and 80 per cent within 27 kilometres. This is interesting because Figure 12 shows that the distribution of spend in this category across different centre/area types has a higher share of spend in minor urban centres (than spend across all categories), suggesting a lower distance effect would be expected. The large differences in this profile suggests that consumers are accessing services non-locally due to a level of specialisation within this sector. These patterns are not unexpected where people travel further to access medical specialist services which are in fewer locations across the region. Although, where this sector differs to the broad pattern of other less frequent retail offering is in its lesser concentration into larger centres than other sectors where supply is centralised. Part of this effect may also be due to loyalty to certain doctors meaning consumers exhibit less substitutability of supply.

The distance effect of all other centre/area types fall within a much narrower range between these two extremes. Of the remaining categories, 60 per cent of the spend occurs from households within 9-10 kilometres, and 80 per cent within 15-19 kilometres.

When spend distance effects are examined by centre/area type different patterns begin to emerge. Separating the spend in this way disaggregates the effects of the relative distribution of activity of a category within the urban retail structure. The distance curves for each retail/services category are displayed for each centre type in Figures 27 to 33 in Appendix 5. Table 6 also provides a summary of these by displaying the upper distance bounds at the 60 and 80 per cent cumulative spend levels for each spend category/centre type combination.

**Table 6. Road network distance within which 60 and 80 per cent of Auckland household spend occurs by centre/area type, 2011**

Spend category	Centre/area type							Survey total
	City centre	City centre fringe	Major urban	Minor urban	Non-centre	Rural/satellite	Sub-regional	
<b>Automotive</b>								
60% of cumulative spend	12	6	6	4	7	12	6	<b>7</b>
80% of cumulative spend	16	12	14	8	14	23	11	<b>14</b>
<b>Core retail</b>								
60% of cumulative spend	11	7	9	7	9	15	9	<b>9</b>
80% of cumulative spend	16	14	17	13	15	23	15	<b>16</b>
<b>Food and liquor</b>								
60% of cumulative spend	6	6	4	3	7	10	7	<b>5</b>
80% of cumulative spend	12	11	7	6	10	20	10	<b>9</b>
<b>Hospitality</b>								
60% of cumulative spend	12	8	6	6	7	17	9	<b>9</b>
80% of cumulative spend	18	14	14	13	15	38	15	<b>15</b>
<b>Medical services</b>								
60% of cumulative spend	17	18	17	21	47	47	18	<b>19</b>
80% of cumulative spend	23	25	26	26	71	71	25	<b>27</b>
<b>Other retail</b>								
60% of cumulative spend	12	8	7	5	10	17	10	<b>9</b>
80% of cumulative spend	18	14	15	12	23	31	17	<b>17</b>
<b>Other store types</b>								
60% of cumulative spend	14	10	7	5	24	23	8	<b>10</b>
80% of cumulative spend	22	18	16	14	32	43	16	<b>18</b>
<b>Personal services</b>								
60% of cumulative spend	14	9	7	9	11	23	10	<b>10</b>
80% of cumulative spend	23	19	15	21	23	48	18	<b>19</b>
<b>Recreation</b>								
60% of cumulative spend	13	7	7	11	10	15	9	<b>10</b>
80% of cumulative spend	19	13	13	43	18	25	16	<b>16</b>
<b>Total</b>								
60% of cumulative spend	<b>11</b>	<b>8</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>14</b>	<b>8</b>	<b>7</b>
80% of cumulative spend	<b>16</b>	<b>14</b>	<b>11</b>	<b>8</b>	<b>13</b>	<b>26</b>	<b>13</b>	<b>13</b>

Data source: Marketview Ltd and Auckland road network distance matrix.

The differences in distance profiles exist where a component of each larger centre is still serving local demand for goods/services that would have a higher propensity to be purchased at smaller centres if they were closer. Food and liquor retailing illustrates this point well where localised distance effect curves across all centre types correspond to high shares of minor urban centres spend within this category.

Automotive services are typically also *relatively* localised (to a lesser extent) across minor urban, sub-regional, rural/satellite and city centre fringe centres. Conversely, the larger distance effects of medical services occur across all centre types. Personal services and other store type retailing also have larger distance effect curves in the city centre, city centre fringe, minor urban, non-centre areas and rural/satellite centres.

Other than medical services, similarities in the distance effect curves of other retail/services types in the city centre, city centre fringe, major urban and sub-regional centres suggest these centres have similar catchments for the remaining categories. Greater variation in catchment sizes exists between retail/services types in minor urban centres, non-centre areas and rural/satellite centres. Within each of these, much greater variability in distance exists at the 80 per cent cumulative spend level than the 60 per cent level. This shows that the variation in cumulative sizes is occurring in the non-local component of the role of these centres.

## 5.4 Results summary

This section has described the findings at a regional level from the retail land use survey analysis of this project. The initial stages of centre classification broadly identified a regional hierarchy, although significant retail areas were identified as falling outside of the centres-based framework. Within this structure, it was appropriate to develop a further classification of 'city centre fringe' centres due to the likely interaction between tiers within the hierarchy, meaning that the spatial role these centres would perform in Auckland would likely differ to that suggested by their household sectors employment size and structure. Household spend occurring at the workplace would be a key contributor for this effect as these are large employment centres beyond their household goods/services share of activity.

The centres and areas covered within the survey frame include about three-quarters of Auckland's retail and hospitality sectors employment, and about half of the remaining household sectors employment. The remaining retail and hospitality employment still accounts for a significant share of this activity and is dispersed throughout the region in smaller centres or other non-centre retail/services groupings.

A large share of the regional retail/services employment is contained within sub-regional and major urban centres. These centres are more concentrated into core retail sectors while other centres, particularly minor urban centres, have a greater share of hospitality and other household services employment.

The distribution of activity somewhat corresponds to centre hierarchy, but deviation to this relationship occurs where the role and function of centre/area types emerged as a result of *type* of retail supply and geographical location relative to existing household travel patterns.

The largest shares of spend occurred in larger centres, with higher distance effect curves, which quantify and show the geographical scale of this effect. At a high level, these patterns of spend also reflect the household sector employment profiles of these centres, but different ratios of spend per employee occur within different centres and parts of the urban structure. Catchment sizes (as a function of road network distance) were broadly related to centre/area size, where the scale and scope of activity attracts customers across greater distances as well as the centralisation of supply. Again, variations exist within this pattern related to the role and function of a centre (from differences in supply) and their location relative to the overall spatial economy of the region.

While larger centres attract a larger volume of spend across greater distances, and smaller centres have lower shares of spend and lower distance effects, this does not necessarily correspond to the total travel effect for households (and therefore, spatial efficiency). This is because of a frequency of trips relationship operating across this centre structure where households typically make more frequent trips for consumable/smaller goods to smaller centres, and fewer trips for larger purchases to larger centres. As such, these distance effects should be interpreted instead as defining the geographical extent of the spatial role of the centre. The impact of this on the spatial efficiency for households will be examined in a forthcoming working paper focussing on travel effects.

As well as differences in catchment sizes *between* centre/area types, differences occur *within* centre types between different spend categories. Food and liquor spend was most highly localised, followed by automotive, while medical services had the greatest distance effect. Part of this

variation reflected the local demand share of the role of larger centres combined with their wider catchments in other categories. Greater variation in catchment sizes by category existed within minor urban centres, non-centre areas and rural/satellite centres, possibly with a greater influence of non-local demand on wider catchment variability.

## 6 Conclusions and next steps

This report has investigated the urban spatial structure of Auckland's household sector. Within this, it has examined the role and function of different centre/area types for households in relation to how they meet their needs. The research has illustrated the spatial role centres play within Auckland and spatial patterns of household demand.

The findings from this research so far provide key information for Auckland Council planners and policy makers in three main ways:

1. **It provides better understanding of the role of centres/areas within Auckland.** The role and function of centres is becoming increasingly complex due to the multifariousness of consumer demand and mobility, and the multifaceted spatial interactions that occur across Auckland. The findings demonstrate the geographical functioning of centres/areas, how households meet their needs across this structure and the relative influence of the wider urban structure. Centre/area-specific information available in a separate part of this project means that centres/areas can be more accurately understood.

This enables better decisions to be made for different types of areas within Auckland, through being cognisant of their role within the urban structure. Moreover, centre/area-specific information allows planning to reflect local conditions. This information is also a crucial input to understanding the potential impacts of any changes to the geography of the household sector, such as the development or expansion of a centre.

2. **It illustrates how households meet their needs across Auckland's urban structure.** Households meet their needs across a range of different centre/area types and not just their closest centre. This relates to the economics of supply including both centralisation of provision (related to frequency/quantum of purchase), and externalities of agglomeration where retail/services cluster together to enable comparison shopping and efficiency for consumers (driving location competitiveness).

These complexities in the spatial interactions of retail supply and household demand are vital inputs to developing effective smart growth or compact city planning approaches. It cannot be assumed that all needs can be met locally, however, more efficient configurations in the balance of activity across different centre types can be achieved (enabled through planning provisions of land and zoning).

3. **It provides an understanding of Auckland's urban structure and its relationship to household demand.** Understanding how the regional urban structure functions is key to effective planning for local areas and policy development for different types of areas. This is because local areas are impacted by wider urban forces, and will respond differently to supply interventions or changes to the supply-demand relationship. Moreover, policy/strategy needs to understand the interrelationships of the urban structure with growth and household enablement (Resource Management Act 1991), to identify/evaluate effective policy recommendations with favourable outcomes.

The above points illustrate how this research is central to understanding the impact of urban structure and centres on spatial efficiency for households. This arises from the spatial interrelationships of household demand and retail/services supply across the structure.

Further analysis from this research will occur as the project progresses, particularly in relation to identifying the *travel* effects for households from different urban spatial structures<sup>42</sup>. This is distinct to and the next step from identifying the spatial role of centres/areas. The frequency of trips and scale of purchases need to be considered concurrently to understand the overall impact on household travel and therefore, spatial efficiency. Part of the effect also occurs through the location of household growth and characteristics (e.g. density and household composition) of residential areas within the urban plane. These factors will be considered together in the next phase of the project.

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<sup>42</sup> This also includes understanding the impact of household spend occurring at the workplace or during travel to other locations.

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## Appendix 1 - Spatial distribution of retail and household sector employment by meshblock in Auckland, 2011

The following maps display the spatial distribution of employment by meshblock in the retail and household services sectors across Auckland. For ease of display, these exclude rural/satellite centres, although these were captured in the survey. These were used to examine the spatial economic structure of the household sector to identify concentrations of retail/household services within Auckland and their relative size and location to other concentrations. The employment intervals used in this scale included less disaggregation at lower intervals so that major urban centres and larger areas of activity could be identified at the regional scale, while smaller centres were identified subsequently using a finer scale and through work already conducted for the Auckland Plan centres identification process. As well as major regional concentrations, these maps also illustrate the high dispersion of retail/household services across Auckland and outside of defined centre areas.

The retail and household sectors and their ANZSIC codes displayed here include G Retail Trade, H45 Food and Beverage Services, and activities from within the I Transport, Postal and Warehousing (passenger transport and services, and postal), J Information Media and Telecommunications (libraries, cinemas, internet cafes), K Financial and Insurance Services (largely, banks), L Rental, Hiring and Real Estate Services, M Professional, Scientific and Technical Services (household professional services), N722 Travel Agency Services, O Public Administration and Safety, P Education and Training, Q Health Care and Social Assistance, R Arts and Recreation Services and S Other Services sectors.

Figure 14. Household sector employment by meshblock in Hibiscus Coast metropolitan areas, 2011

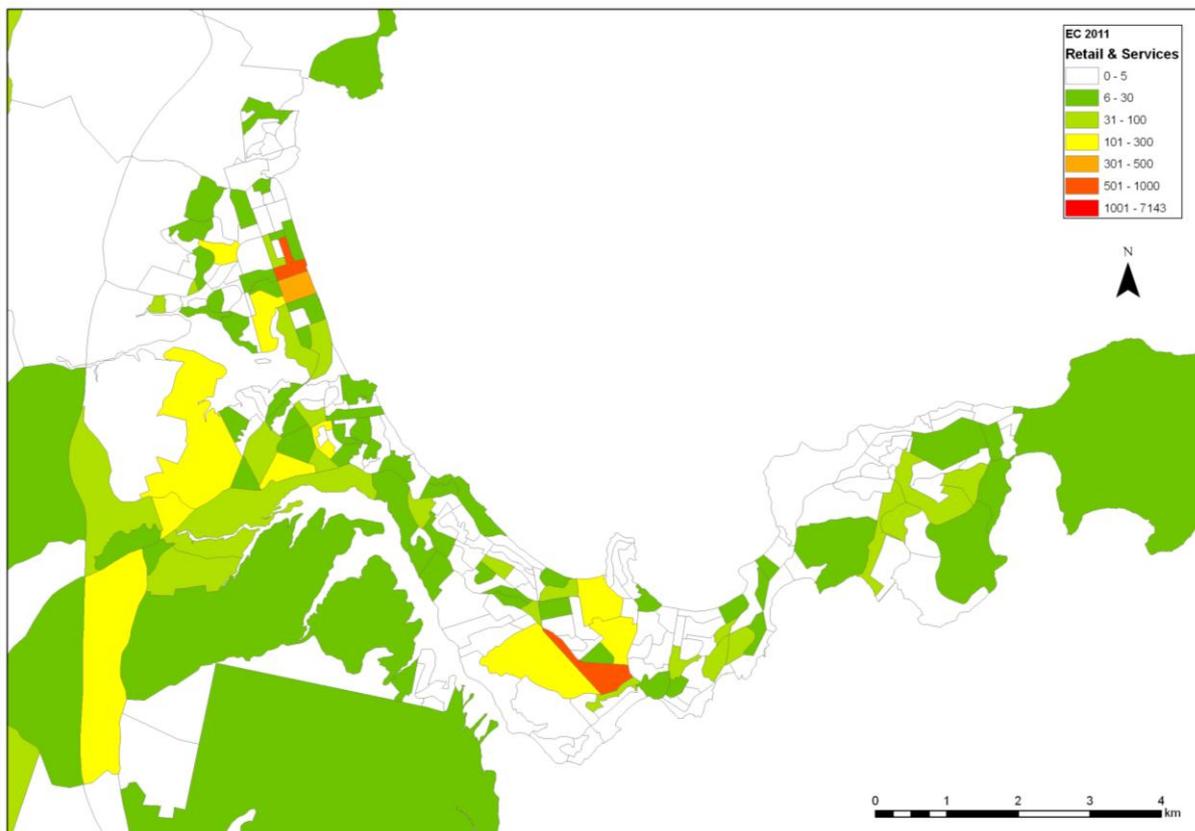


Figure 15. Household sector employment by meshblock in North Shore metropolitan area, 2011

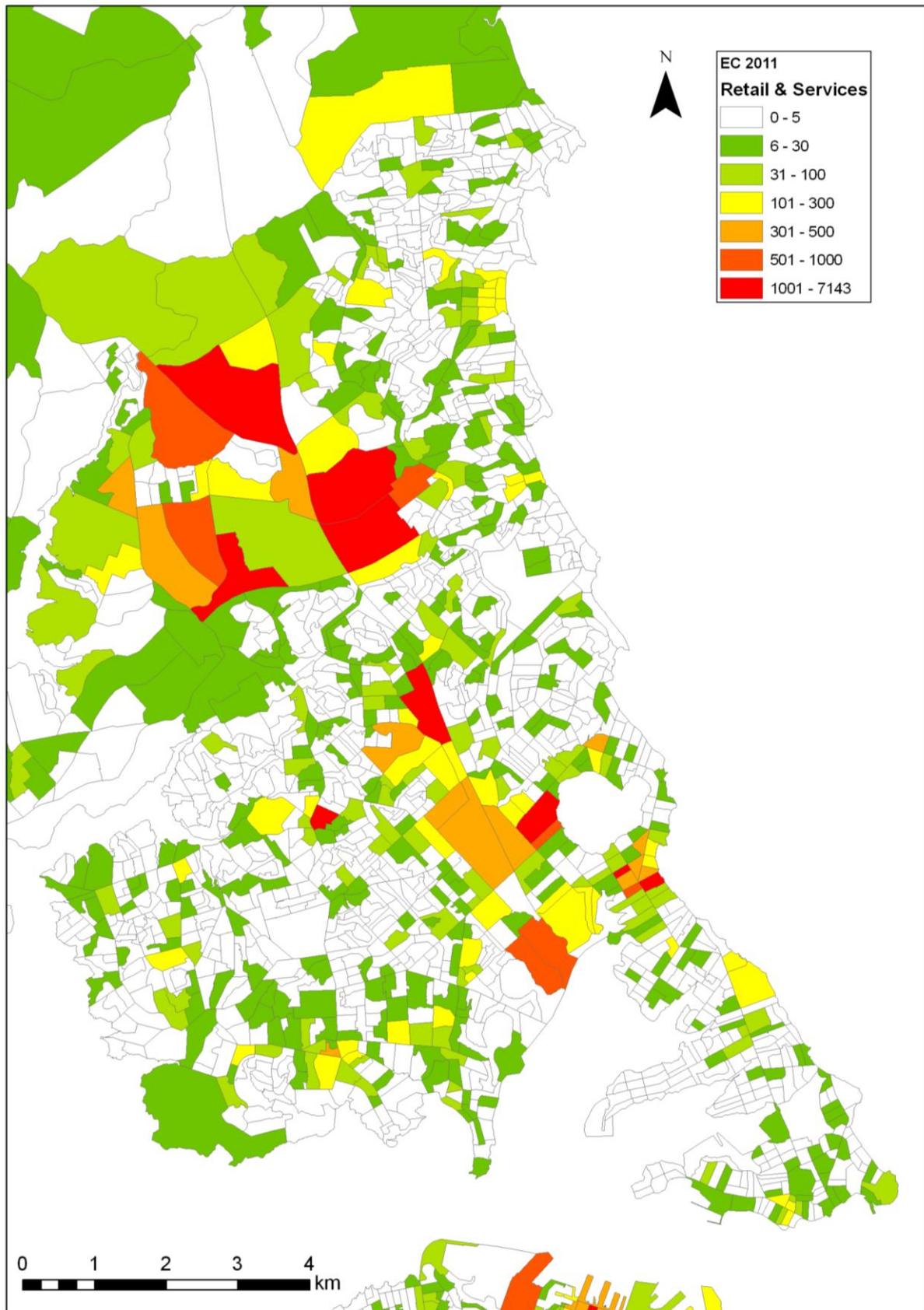


Figure 16. Household sector employment by meshblock in west Auckland metropolitan areas, 2011

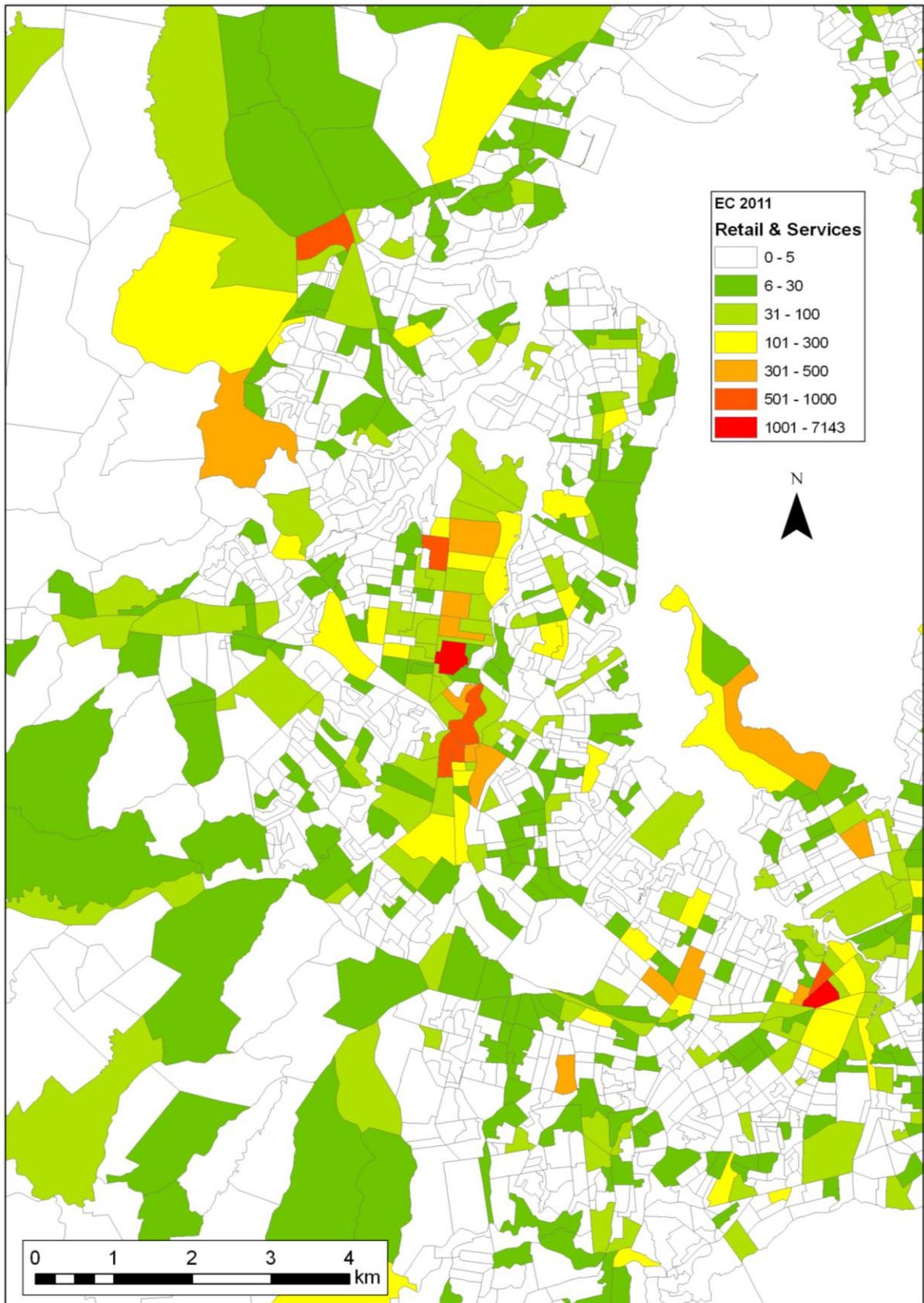


Figure 17. Household sector employment by meshblock in Auckland isthmus metropolitan area, 2011

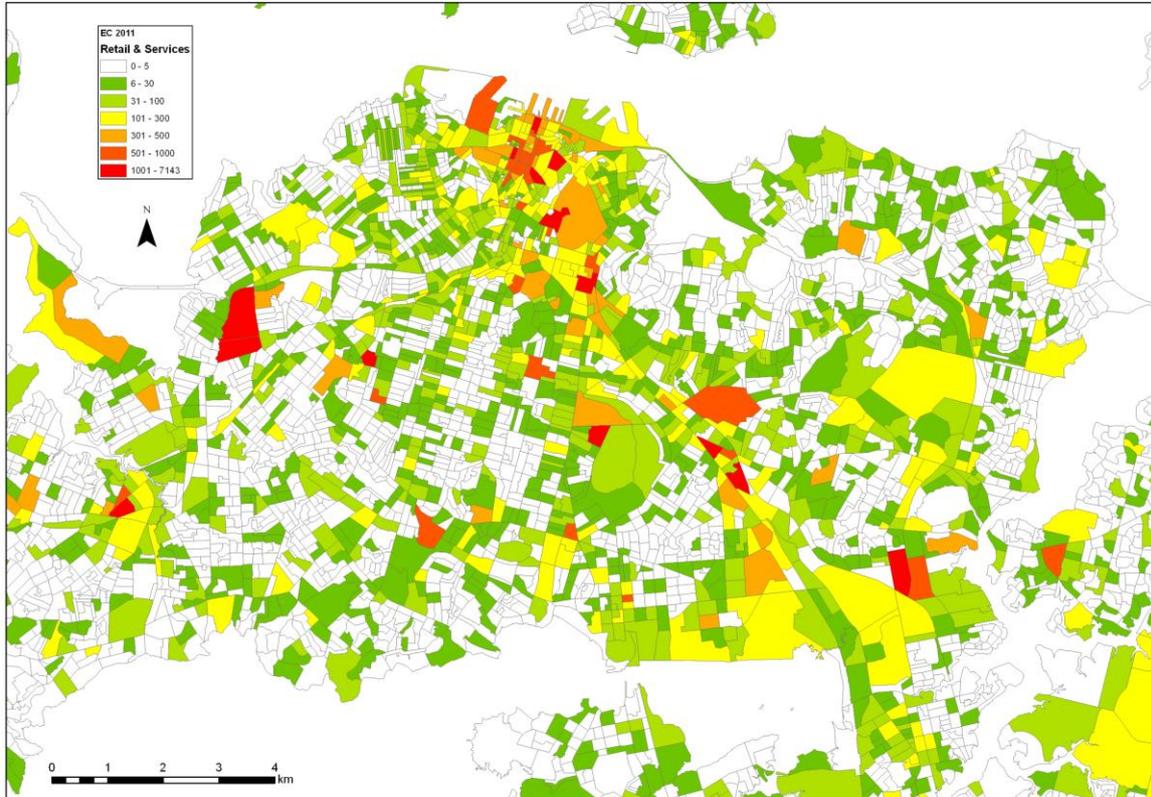


Figure 18. Household sector employment by meshblock in East Auckland metropolitan areas, 2011

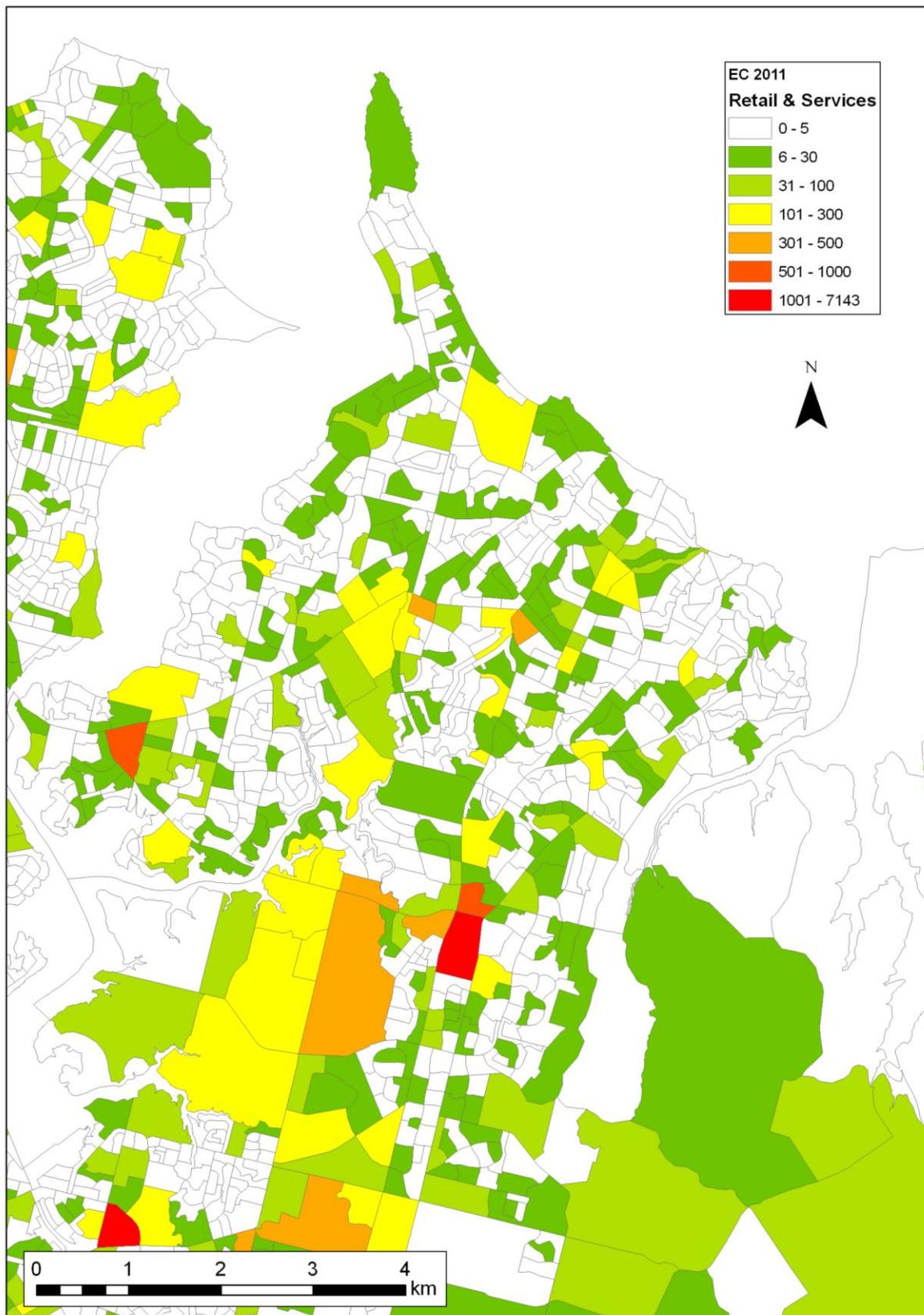
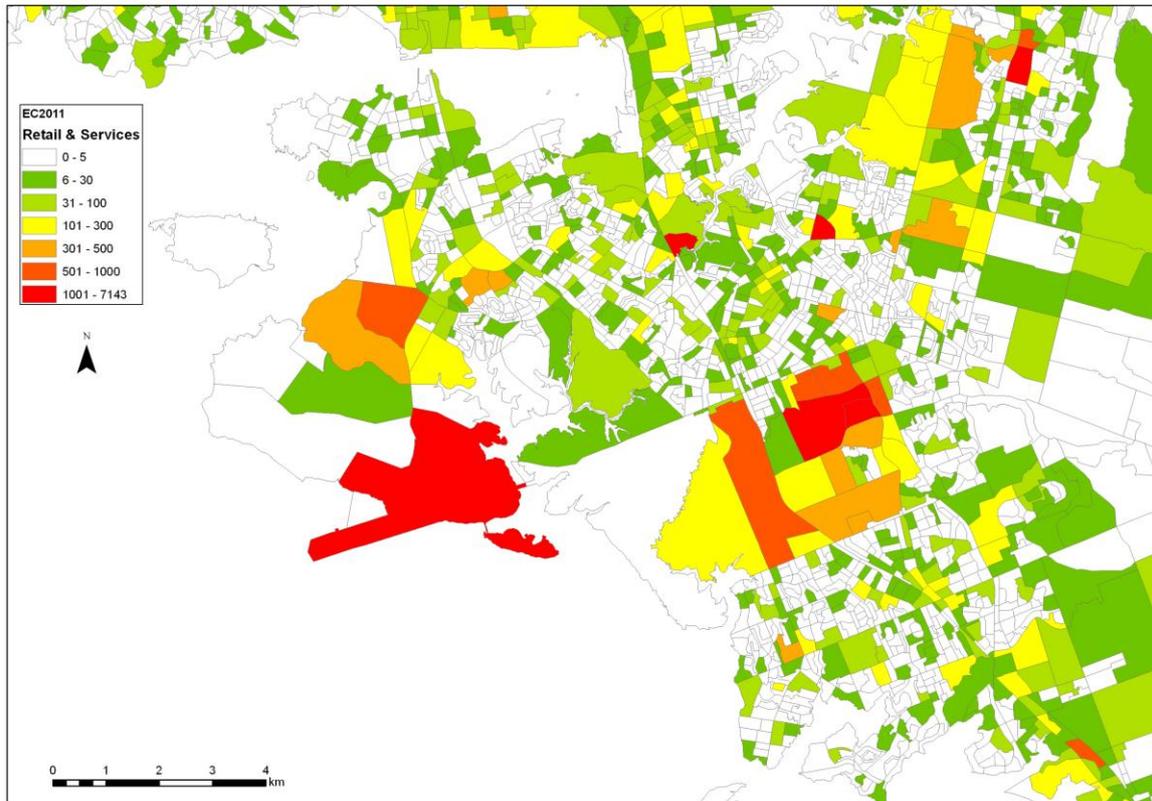


Figure 19. Household sector employment by meshblock in southern Auckland metropolitan areas, 2011



## Appendix 2 – Regional maps of Auckland centres/areas

Figures 20 and 21 display the distribution of centres/areas included in the analysis and their relative positioning within the urban structure.

Figure 20. Regional map of Auckland centres/areas included in the analysis

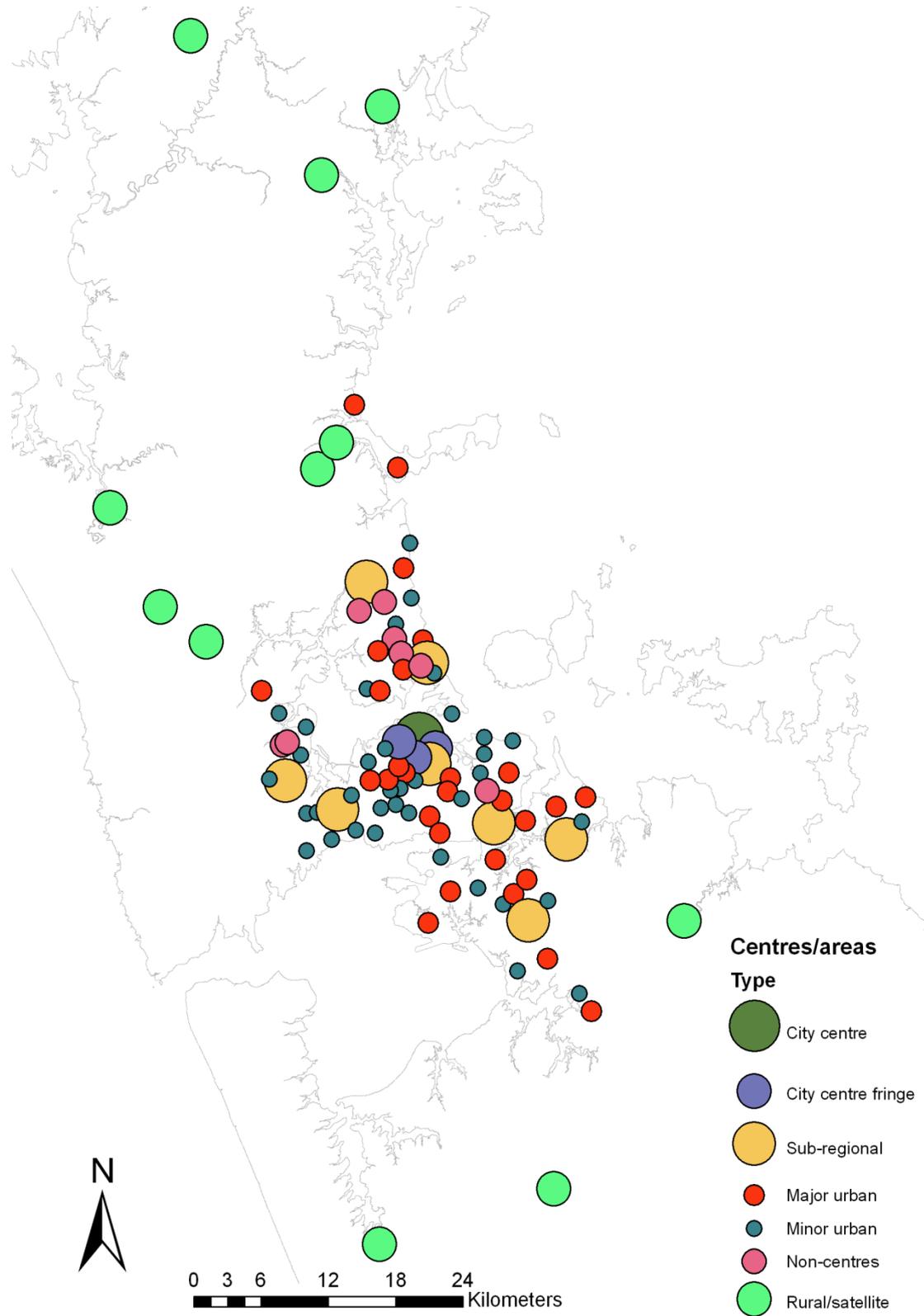
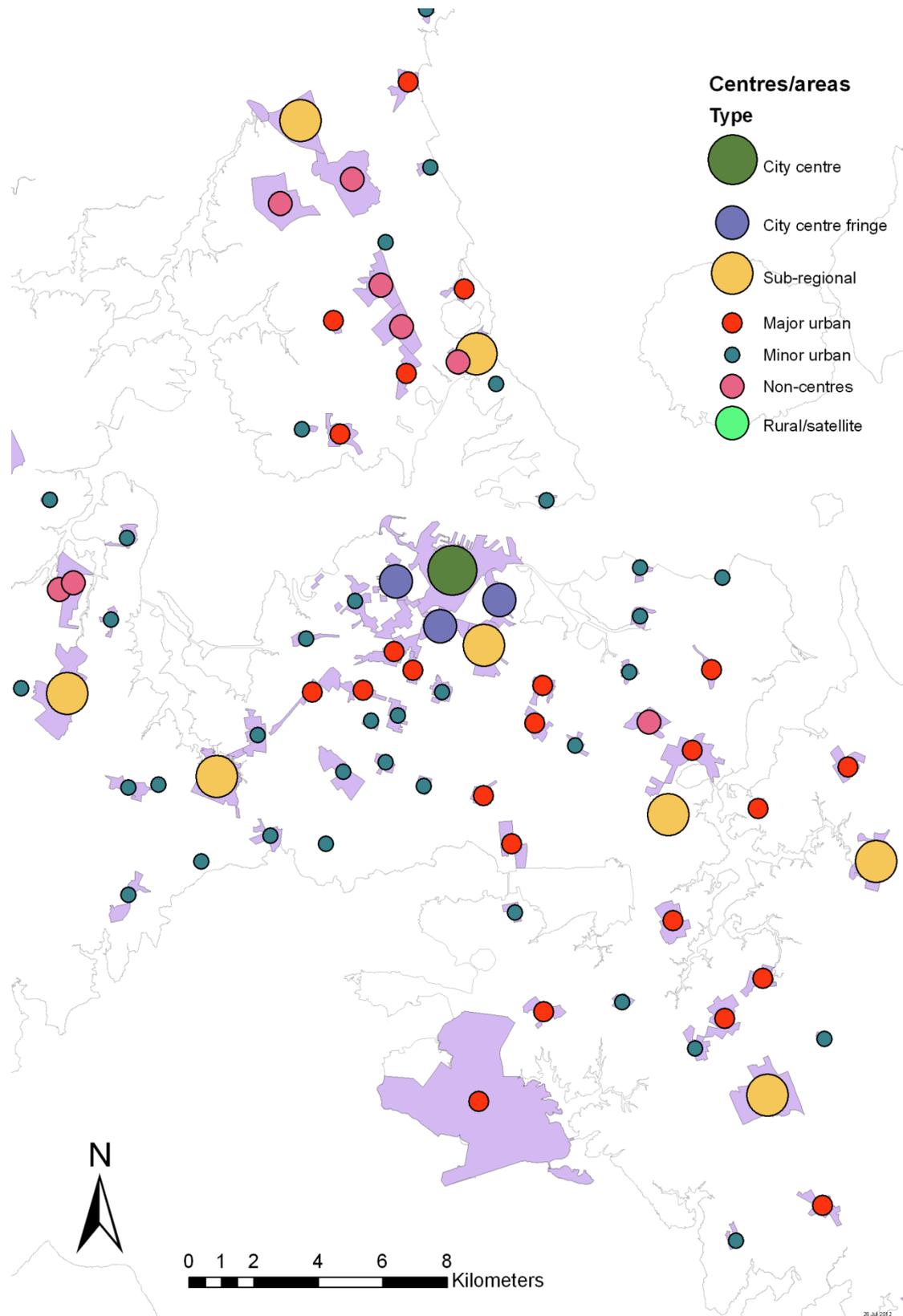


Figure 21. Regional map of urban Auckland centres/areas included in the analysis



### Appendix 3 - Household spend origin areas in metropolitan Auckland

The maps contained within this appendix display the household spend origin areas for which Marketview spend data was obtained. These represent groupings of 3-4 contiguous meshblocks and form the basis of a converted household number weighted distance matrix for Auckland used in the analysis of this research. Although analysis was also conducted for rural areas, these maps focus on urban Auckland areas for purposes of display.

Figure 22. Household spend origin areas in Hibiscus Coast Auckland metropolitan areas

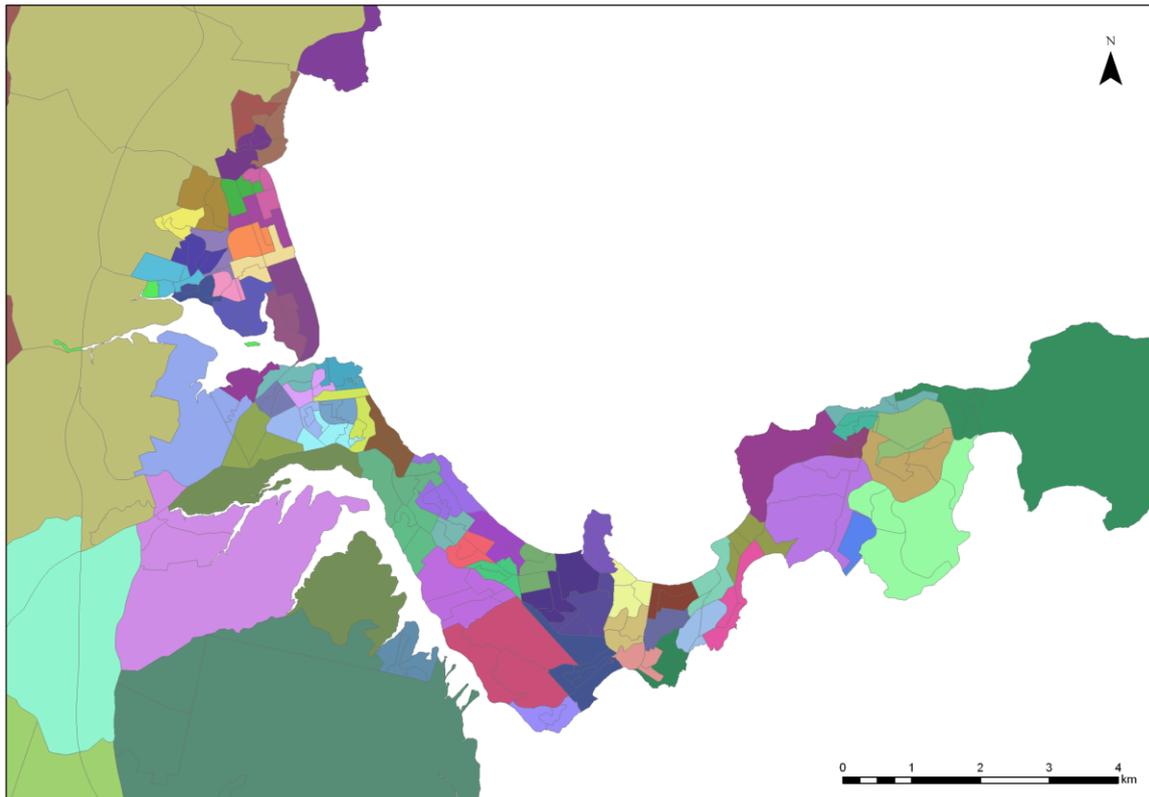


Figure 23. Household spend origin areas in northern metropolitan Auckland

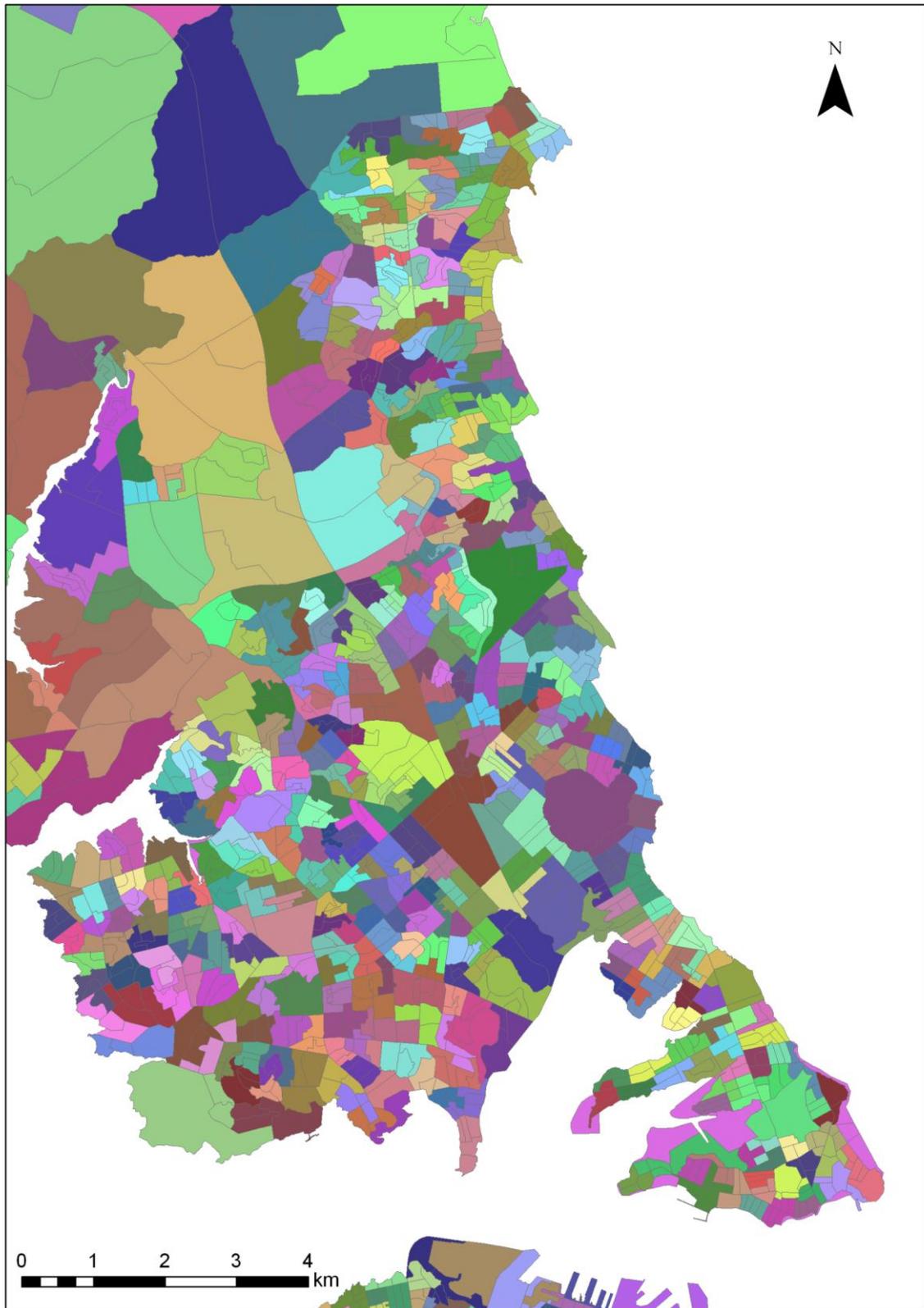


Figure 24. Household spend origin areas in western metropolitan Auckland

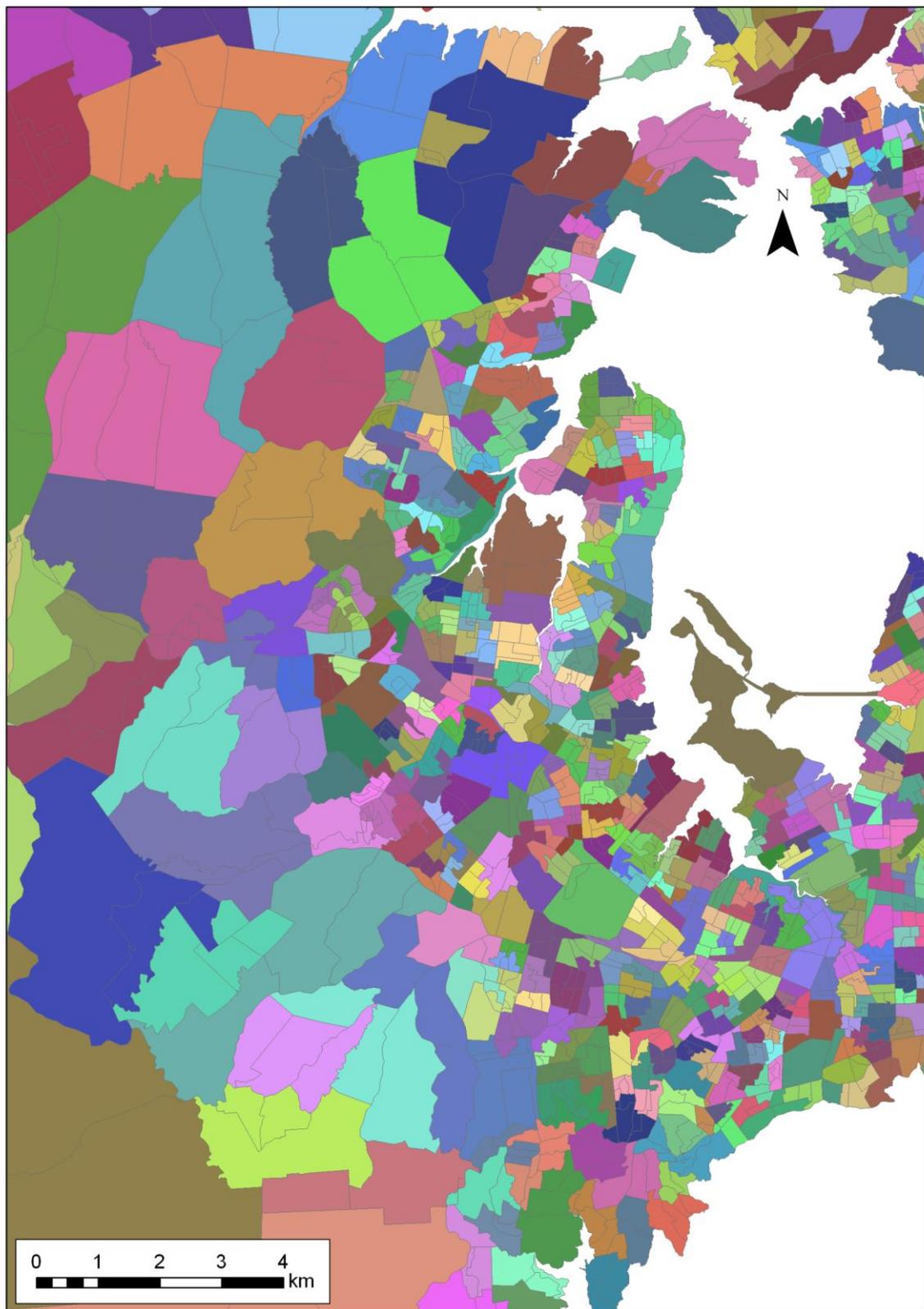


Figure 25. Household spend origin areas in Auckland isthmus and east metropolitan Auckland

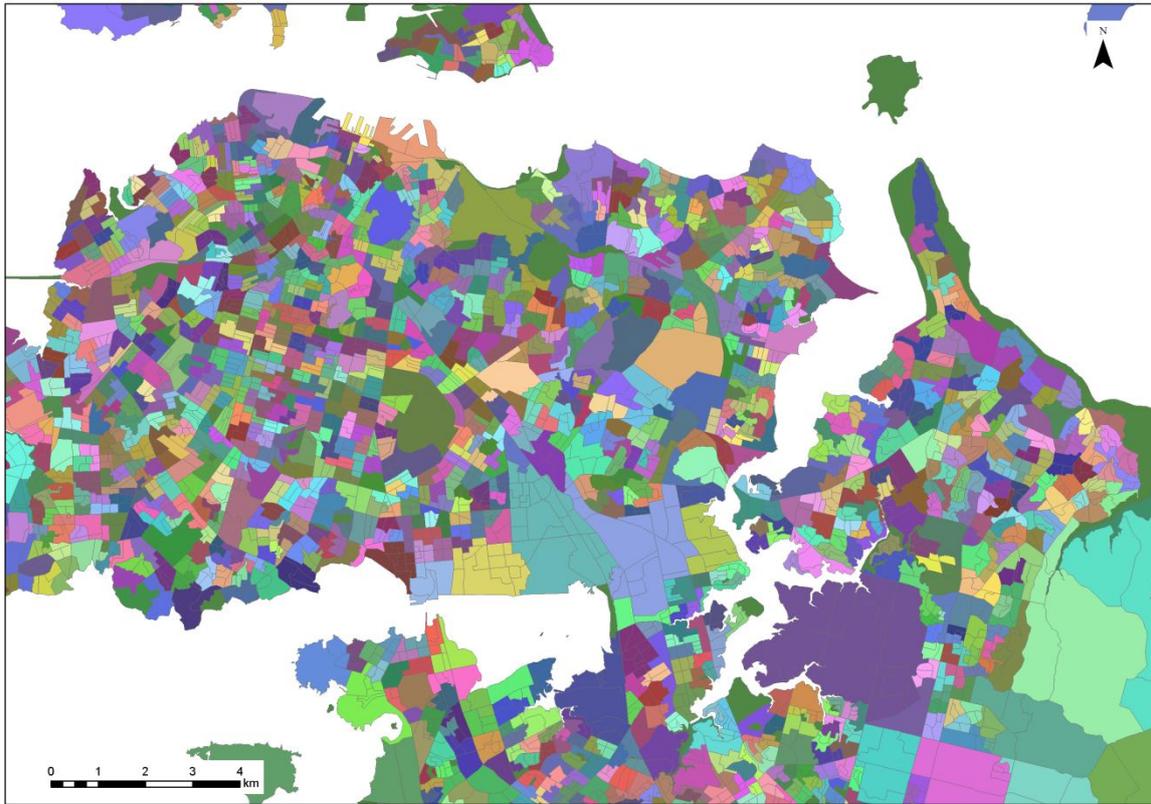
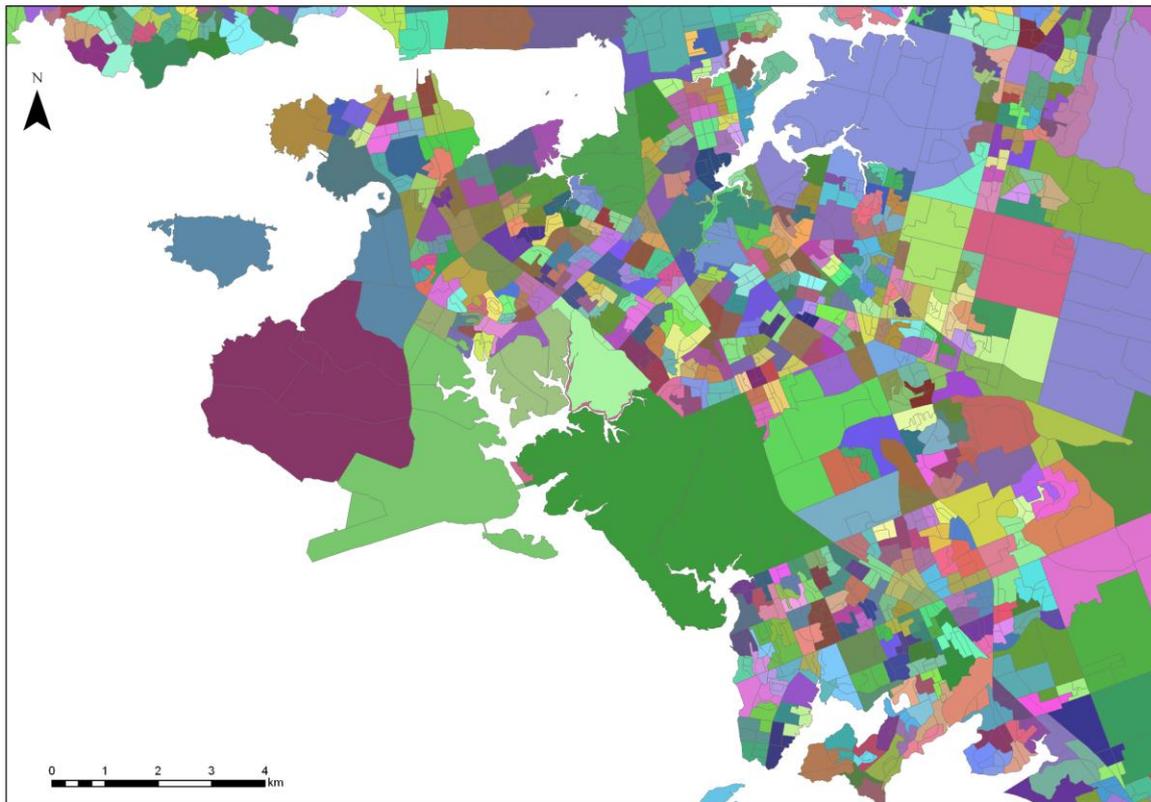


Figure 26. Household spend origin areas in southern metropolitan Auckland



## Appendix 4 - Household sector employment in surveyed centres

Table 7 shows the share of Auckland household sector employment contained within different areas of the centre/area structure used for this research. These categories broadly correspond to those identified earlier in Table 1 (section 3.1.1) but are aggregated slightly differently. Moreover, non-bank financial operations, construction and public administration and safety activities have been excluded from this classification given the large share of non-household related activity in these sectors potentially skewing results.

**Table 7. Auckland share of employment in each household sector captured within the survey frame, 2011**

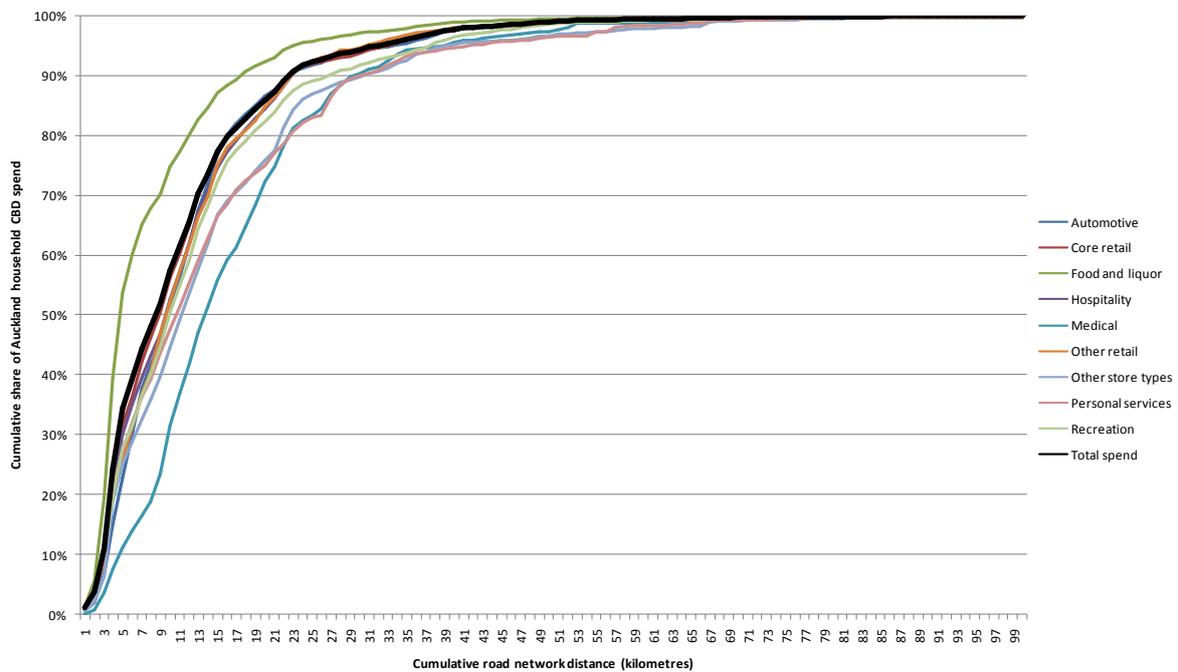
Household sector	Centre/area type							Survey area total	Auckland total
	City centre	City centre fringe	Major urban	Minor urban	Non-centre	Rural/satellite	Sub-regional		
Automotive retailing and repair	190 2%	239 2%	1,459 12%	691 6%	1,537 13%	687 6%	1,912 16%	6,715 56%	<b>11,908</b> <b>100%</b>
Supermarkets and dairies	313 2%	27 0%	4,482 34%	2,818 21%	841 6%	943 7%	2,721 20%	12,145 91%	<b>13,370</b> <b>100%</b>
Other food and liquor retailing	191 5%	105 3%	755 20%	484 13%	178 5%	125 3%	474 13%	2,312 62%	<b>3,750</b> <b>100%</b>
Furniture, floor coverings, houseware and textile goods retailing	63 2%	153 5%	398 14%	90 3%	492 17%	114 4%	843 30%	2,153 76%	<b>2,850</b> <b>100%</b>
Electrical and electronic goods retailing	280 9%	147 4%	390 12%	64 2%	358 11%	65 2%	1,266 39%	2,570 79%	<b>3,270</b> <b>100%</b>
Hardware, building and garden supplies retailing	125 3%	18 0%	323 7%	251 5%	969 21%	403 9%	575 12%	2,664 57%	<b>4,680</b> <b>100%</b>
Recreational goods retailing	514 17%	92 3%	491 16%	93 3%	251 8%	99 3%	909 29%	2,449 79%	<b>3,090</b> <b>100%</b>
Clothing, footwear and personal accessories retailing	953 11%	242 3%	2,144 25%	150 2%	91 1%	191 2%	3,921 46%	7,692 89%	<b>8,600</b> <b>100%</b>
Department stores	410 7%	- 0%	1,233 21%	90 2%	260 4%	165 3%	2,485 43%	4,643 80%	<b>5,790</b> <b>100%</b>
Pharmaceutical and other store-based retailing	719 9%	257 3%	2,222 28%	733 9%	344 4%	281 4%	1,356 17%	5,912 76%	<b>7,800</b> <b>100%</b>
Non-store retailing	202 18%	27 2%	106 9%	18 2%	98 9%	6 1%	33 3%	490 44%	<b>1,125</b> <b>100%</b>
Hospitality	5,847 20%	1,446 5%	5,063 18%	2,683 9%	1,279 4%	833 3%	4,182 14%	21,333 74%	<b>28,920</b> <b>100%</b>
Transport/postal	1,425 21%	156 2%	781 12%	517 8%	538 8%	149 2%	305 5%	3,871 58%	<b>6,630</b> <b>100%</b>
Recreational services	4,079 19%	1,047 5%	2,582 12%	841 4%	625 3%	390 2%	2,039 10%	11,603 55%	<b>21,006</b> <b>100%</b>
Other personal and household services	7,458 32%	863 4%	3,641 16%	947 4%	602 3%	614 3%	3,203 14%	17,328 75%	<b>23,205</b> <b>100%</b>
Education and training	7,282 13%	436 1%	3,271 6%	768 1%	845 2%	669 1%	3,012 5%	16,283 29%	<b>55,250</b> <b>100%</b>
Medical and social assistance	792 1%	779 1%	4,063 7%	1,281 2%	2,032 3%	1,601 3%	3,066 5%	13,614 23%	<b>60,460</b> <b>100%</b>
<b>Total household sector</b>	<b>30,845</b> <b>12%</b>	<b>6,034</b> <b>2%</b>	<b>33,407</b> <b>13%</b>	<b>12,520</b> <b>5%</b>	<b>11,341</b> <b>4%</b>	<b>7,336</b> <b>3%</b>	<b>32,305</b> <b>12%</b>	<b>133,788</b> <b>51%</b>	<b>261,720</b> <b>100%</b>

Data source: Statistics New Zealand 2011 *Business Demographic dataset*.

## Appendix 5 - Cumulative spend curves by spend category for each centre/area type, 2011

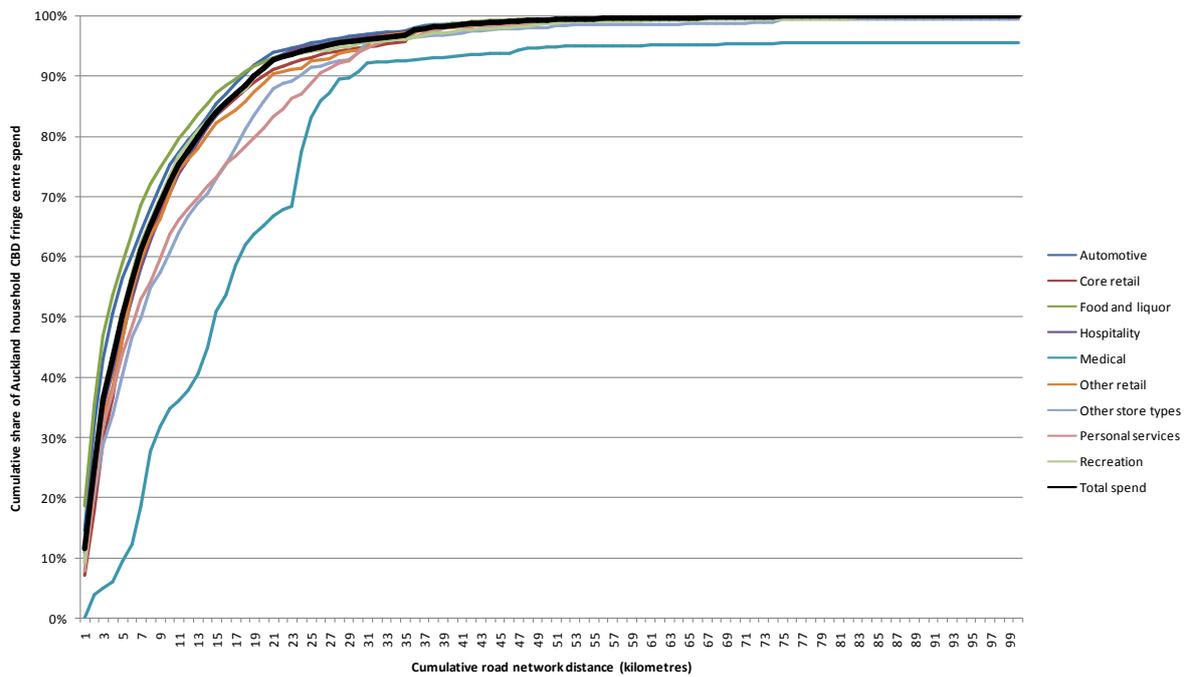
The Figures in this appendix display the cumulative spend by road network distance curves by spend category for each Auckland centre/area type within the survey frame. The spend is electronic Auckland household spend for the 2011 calendar year.

Figure 27. Cumulative Auckland household spend by distance for each spend category in Auckland city centre, 2011



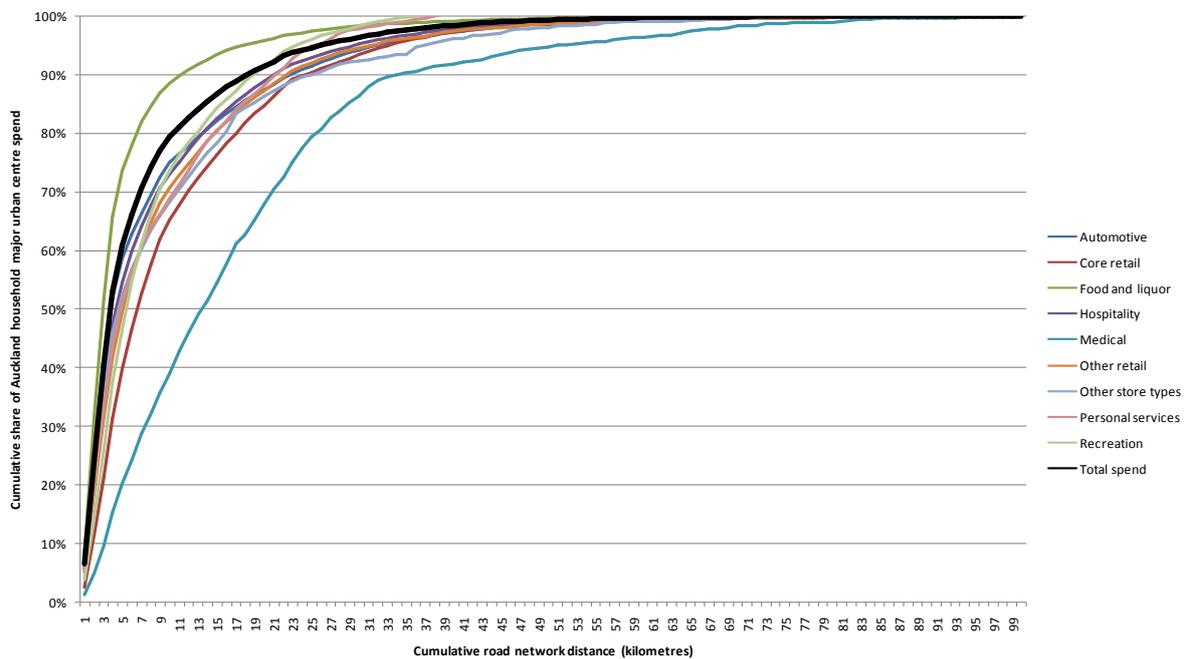
Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 28. Cumulative Auckland household spend by distance for each spend category in city centre fringe centres, 2011



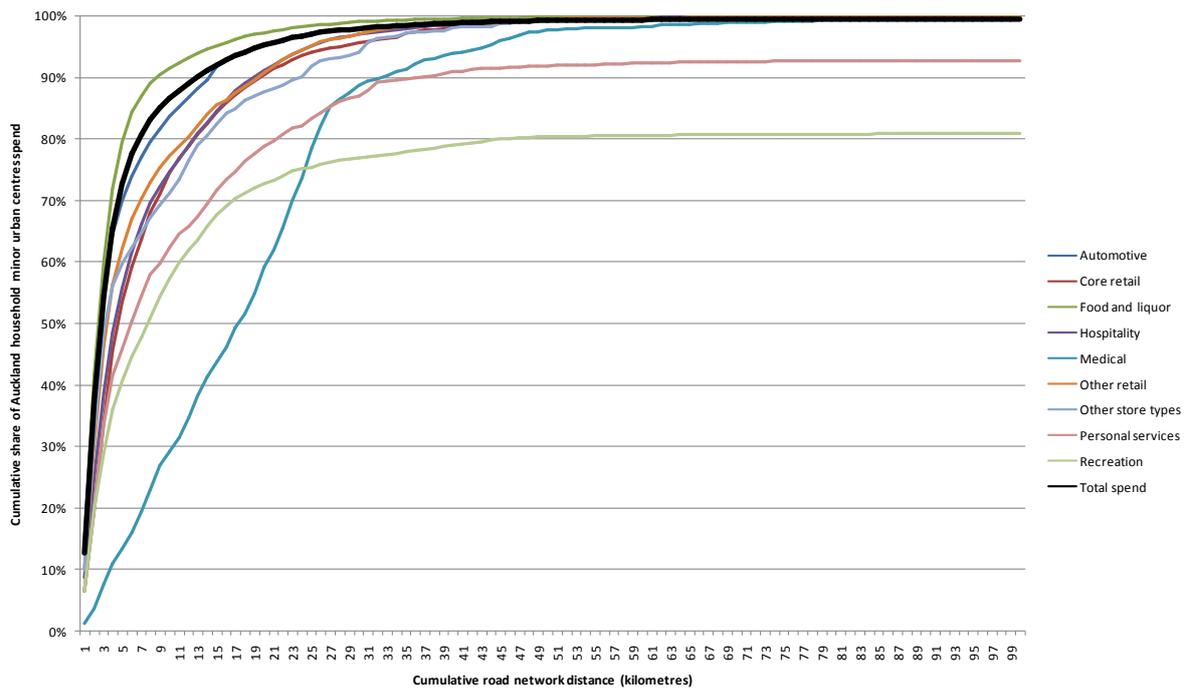
Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 29. Cumulative Auckland household spend by distance for each spend category in major urban centres, 2011



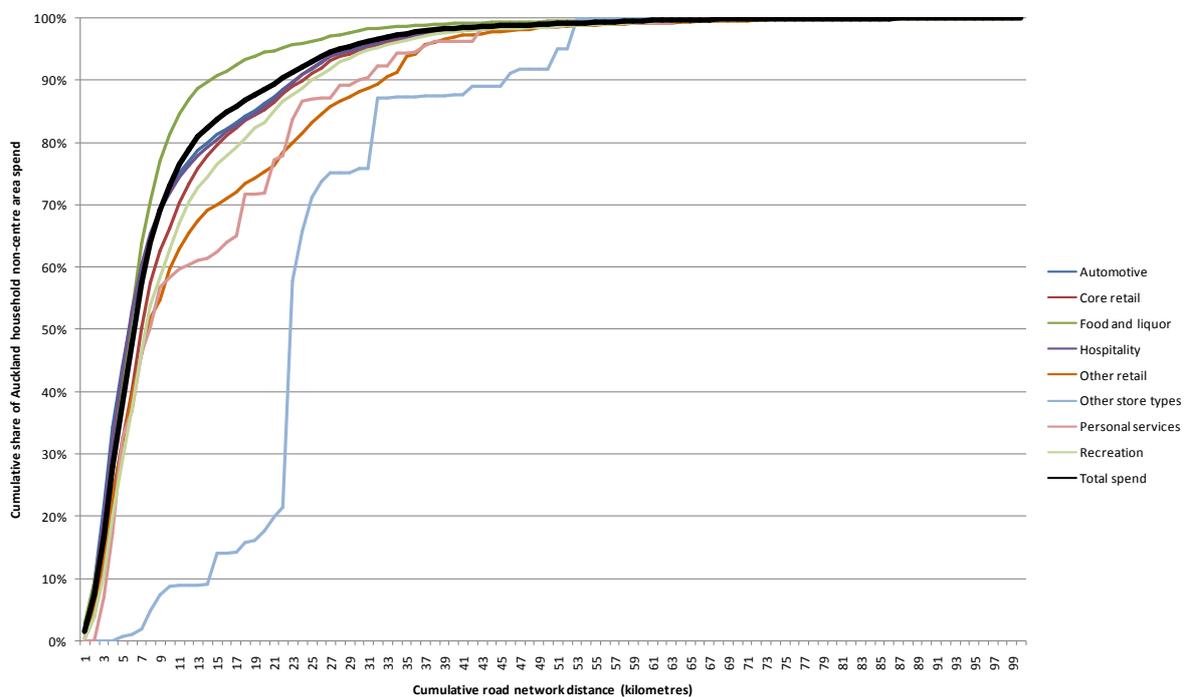
Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 30. Cumulative Auckland household spend by distance for each spend category in minor urban centres, 2011



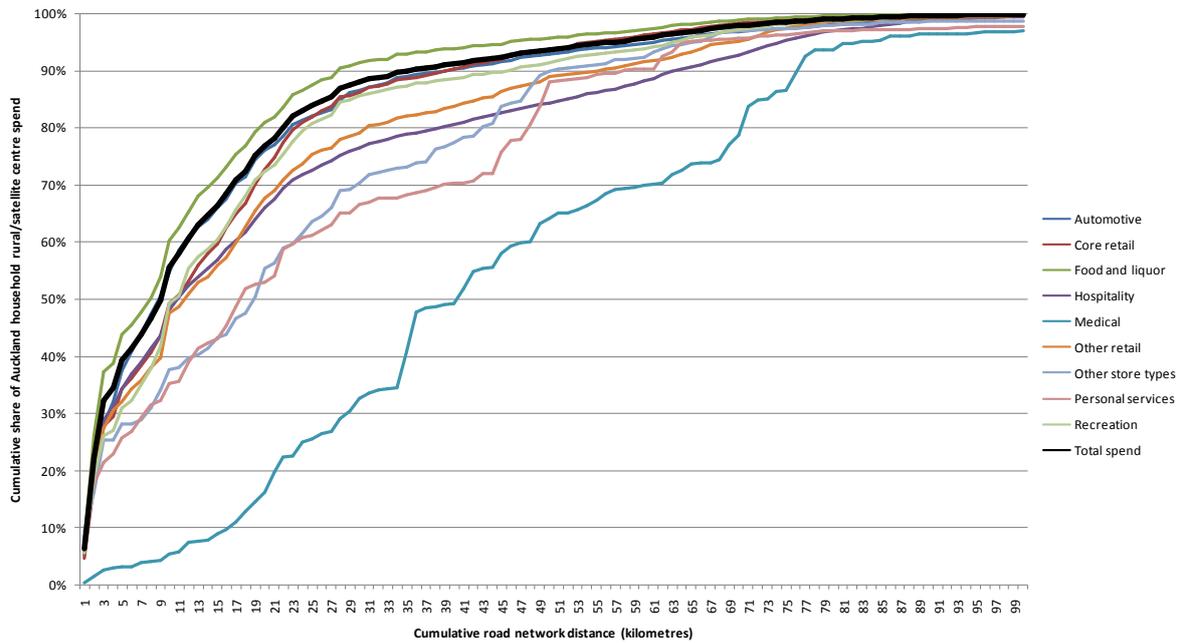
Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 31. Cumulative Auckland household spend by distance for each spend category in non-centre areas, 2011



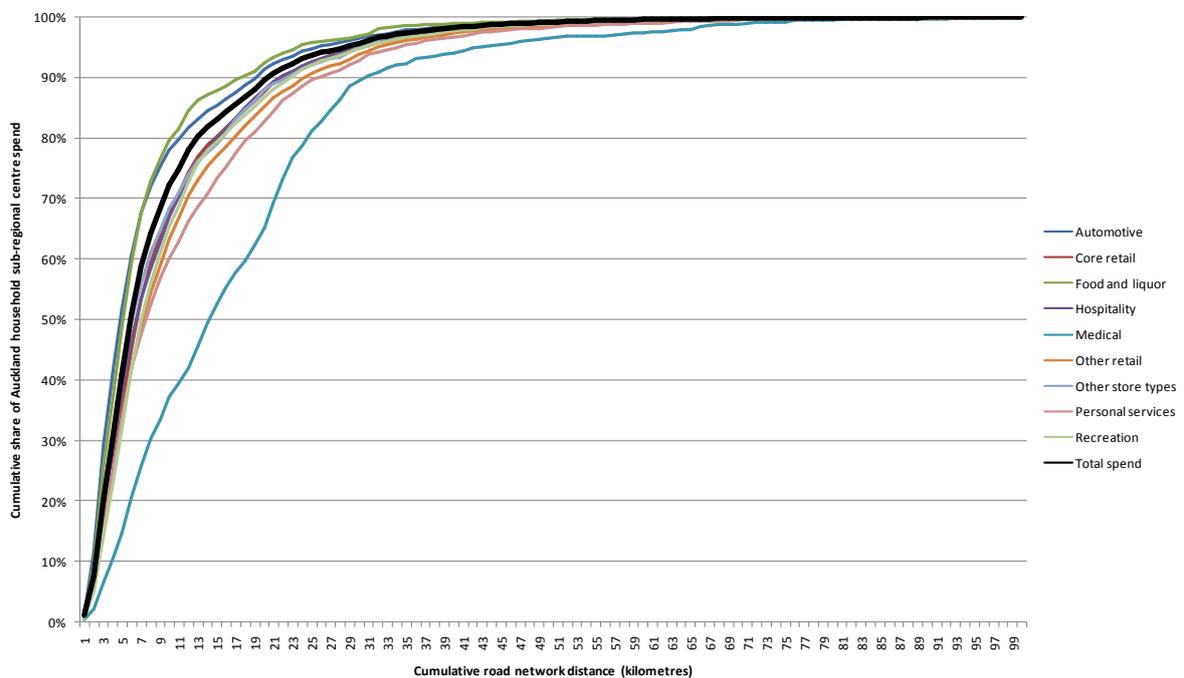
Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 32. Cumulative Auckland household spend by distance for each spend category in rural/satellite centres, 2011



Data source: Marketview Ltd and Auckland road network distance matrix.

Figure 33. Cumulative Auckland household spend by distance for each spend category in sub-regional centres, 2011



Data source: Marketview Ltd and Auckland road network distance matrix.