

# **THE IMPACT OF HEAVY VEHICLES ON RESIDENTS ON ARTERIAL ROADS AND STATE HIGHWAYS**

Rebecca E. Luther

Brett D. Alley

Peter H. Baas

Tom Ludvigson

Brenda J. Wigmore

Transport Engineering Research New Zealand Ltd.

Samuel G. Charlton

Transport Engineering Research New Zealand Ltd.

University of Waikato

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PO Box 97846  
South Auckland Mail Centre  
New Zealand  
Ph 09 2622 556

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### **Introduction**

The main goal of this study was to examine the effects of heavy vehicles on residents living on main truck routes. The study aimed to examine the effects of heavy vehicles on residents from several perspectives; how concerns regarding heavy vehicles fit into the broader picture of general community concerns; how issues with heavy vehicles compare to other traffic concerns (e.g. traffic volume and speed); and finally, how heavy vehicles affect residents daily lives and activities.

### **Methodology**

To answer these questions a detailed survey was constructed. The survey itself focused on answering the three objectives outlined above. The first section aimed to assess how many residents would spontaneously mention traffic and heavy vehicles as a dislike compared to other community issues (such as concern about violence and lack of facilities). The second section aimed to examine the issue of heavy vehicles in relation to other traffic related concerns. In this section perceptions of how each traffic issue contributed to residents' overall sense of traffic danger, nuisance, social effects, environmental effects and effects on property was measured. Finally, the third section aimed to assess the specific effects of heavy vehicles on residents' lives and activities by first asking residents about their perceptions of the volume and safety of heavy vehicle traffic in their area and secondly, by asking residents if (and how) heavy vehicles affected specific activities such as walking, cycling, driving and household/family activities.

Trained interviewers approached every second house on both sides of each road selected for study until they had completed 20 surveys or had surveyed the entire road. However, the pilot study indicated that for some roads the response rate was very high.

Interviewers were instructed that under these circumstances they should choose four sections of road within the designated area and approach every second house in these areas only. This was intended to avoid all completed surveys being from one section of the road. Interviewing was conducted both during the day and in the early evening. This ensured that a broad range of potential respondents was approached.

Respondents were deemed eligible to participate in the survey if they were over 16 years old and were residents of the house. They were not required to own the home, to be one of the main caregivers, or to hold a drivers licence. When the interviewers approached a house they first explained the purpose of the survey and then asked if the person was interested in participating. If the person was interested in participating but unavailable at that time a callback time was arranged. Otherwise, the interviewer checked that the respondents' eligibility then proceeded through the questionnaire.

A total of 255 residents on main arterial roads and state highways in Auckland, Whangarei, Gisborne, and Mt Maunganui were surveyed. The roads in these communities were chosen to reflect a range of heavy vehicle volumes from 2.1% to 32% (see Table One). All of the roads selected were classified as either regional arterial roads or state highways (except for Crawford Rd in Gisborne). Most of the roads chosen, particularly those in Gisborne and Whangarei, were selected in consultation with Council and were chosen because of currently identified traffic issues or because of projected future increases of heavy vehicles.

City Councils supplied traffic count data for Auckland and Whangarei traffic. A traffic count of Maunganui Rd was undertaken with the assistance of Transit NZ. The count data from these cities was calculated to produce 7-day averages for each road. Information on the average total number of vehicles (volume), the total number of light vehicles, the total number of heavy vehicles, and the percentage of total vehicles (traffic composition) were obtained. Because traffic counts were unavailable for the roads of interest in Gisborne at the time of request, a manual count was undertaken. Roads were counted for two hours, during both peak (4pm-6pm) and off-peak (11am-1pm) traffic times. Counts were made between Tuesday and Thursday to avoid fluctuations in vehicle numbers relating to weekend activities. A TERNZ staff member recorded each vehicle that travelled past in either direction and also noted whether it was a light or a heavy vehicle. Heavy vehicles were defined as vehicles with either two axles on the rear of the vehicle or four tyres on the rear axle. This data was then collated to provide estimates of weekly traffic counts.

*Table One. Roads Identified for Surveying*

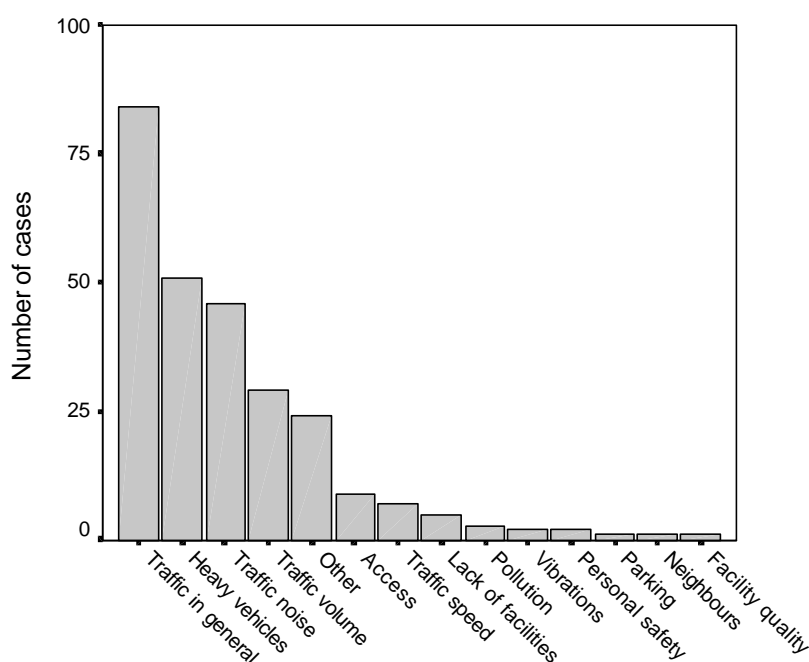
City	Road Name	Location	Road Classification	Average Vehicles Per Day (7 days)	Average Heavy Vehicles Per Day (7 days)	% Heavy Vehicles Per Day (7 days)
Auckland	Mangere Rd	North of Hospital Rd	Regional Arterial	42000	13440	32.0
Auckland	Greenlane West Rd	West of St Andrews Rd	Regional Arterial	10656	3908	26.83
Auckland	Hillsborough Rd	West of Cape Horn Rd	Regional Arterial	13200	1710	13.0
Auckland	Remuera Rd	West of Waitarua Rd	Regional Arterial	12200	1590	13.0
Auckland	Donovan St	West of McFadzean Drive	Regional Arterial	18500	1480	8.0
Auckland	Kepa Rd	East of Patterson Ave	Regional Arterial	23400	1400	6.0
Auckland	West End Rd	East of Fife St	Regional Arterial	17000	510	3.0
Auckland	Manukau Rd	North of Turama Rd	Regional Arterial	12992	276	2.1
Tauranga	Maunganui Rd	East of Hewletts Rd	State Highway	35247	2081	5.9
Gisborne	Awapuni Rd	East of Stanley Rd	State Highway	5400	500	9.0
Gisborne	Lytton Rd	South of Gladstone Rd	Regional Arterial	6900	350	5.0
Gisborne	Wainui Rd	South of Rutene Rd	State Highway	10800	330	3.0
Gisborne	Crawford Rd	Full length	Minor Road	900	160	18.0
Whangarei	Manu Rd	West of Western Hills Dr	State Highway	18184	927	5.37
Whangarei	Hatea Dr	South of Nixon St	Regional Arterial	16673	906	5.75
Whangarei	Mill Rd	North of Nixon St	Regional Arterial	14429	488	3.5

## Results

The response rate for the questionnaire across all centres was 67.48%. Auckland had the highest response rate with 71.15% of residents approached agreeing to take part in the survey. The response rates for Gisborne, Whangarei, and Mt Maunganui were 65.26%, 63.83%, and 64.79% respectively. A broad distribution of residents was surveyed ranging in age from 16 years to over 60 years. However, only seven respondents in the 16 – 20 age group completed the survey. Therefore, it is possible that some of the concerns of this group may not be reflected in the results.

### Perceptions of Heavy Vehicles in Relation to Other Community Issues

The first objective of this study was to examine how concerns about heavy vehicles fitted into the broader picture of general community concerns. Traffic issues in general clearly rated highly in terms of aspects of respondents' communities that they disliked. As Figure 1 shows, disliking the traffic in general was mentioned by 84 respondents (42%), though these respondents were unable to identify a particular traffic issue that they disliked. This was followed by heavy vehicles (51 cases, 26%), traffic noise (46 cases, 23%), and traffic volume (29 cases, 15%). The highest ranked non-traffic issue (lack of facilities) was mentioned by less than ten respondents.



*Figure 1. Dislikes about living in area*

Residents in Gisborne (50%) and Whangarei (30.2%) were substantially more likely to mention heavy vehicles as a dislike than those from Auckland (2.5%) and Mt Maunganui (4.2%). This result was statistically significant ( $\chi^2 = 67.793$ ,  $df = 3$ ,  $p < 0.01$ ). This response was not in line with traffic count data which shows that roads in Auckland averaged 3040 heavy vehicles per day and roads in Mt Maunganui averaged 2081 heavy vehicles per day. By comparison, roads in Whangarei averaged 747 heavy vehicles per day and roads in Gisborne averaged 359 heavy vehicles per day. Within the communities of Gisborne and Whangarei, respondents who were home during the day, were female, or had children living in the household were most likely to mention that they disliked heavy vehicles.

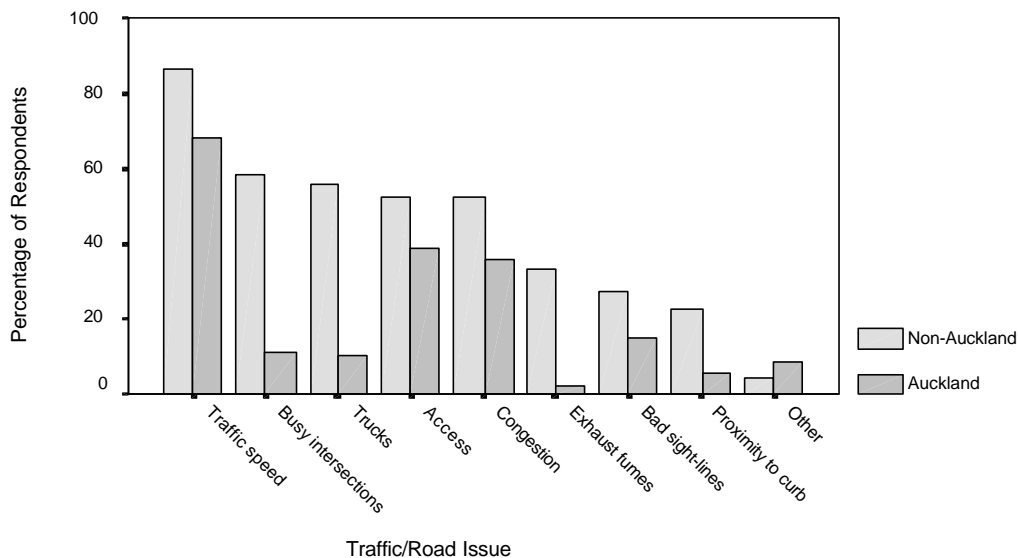
## Perceptions of Heavy Vehicles in Comparison to Other Traffic Issues

The second objective of this research was to assess the impact of heavy vehicles in relation to other traffic issues. Therefore respondents on roads with different levels of heavy vehicles were asked to rate the danger and nuisance of the traffic and roads in their area. In addition, they were asked about the effect of the traffic and roads on their property, community, and environment.

### *Perceptions of Heavy Vehicles Compared to Other Traffic Issues - Danger*

The analyses conducted on perceptions of overall traffic danger showed that that ratings of danger were significantly different between Aucklanders and non-Aucklanders (Kruskal Wallis = 8.099,  $df = 3$ ,  $p < 0.05$ ). Aucklanders tended to rate the danger of the traffic and roads in their area lower than non-Aucklanders. It is also notable that females tended to rate the danger of the traffic as significantly higher than males (Mann-Whitney = 5749.5,  $z = -2.089$ ,  $p < 0.05$ ).

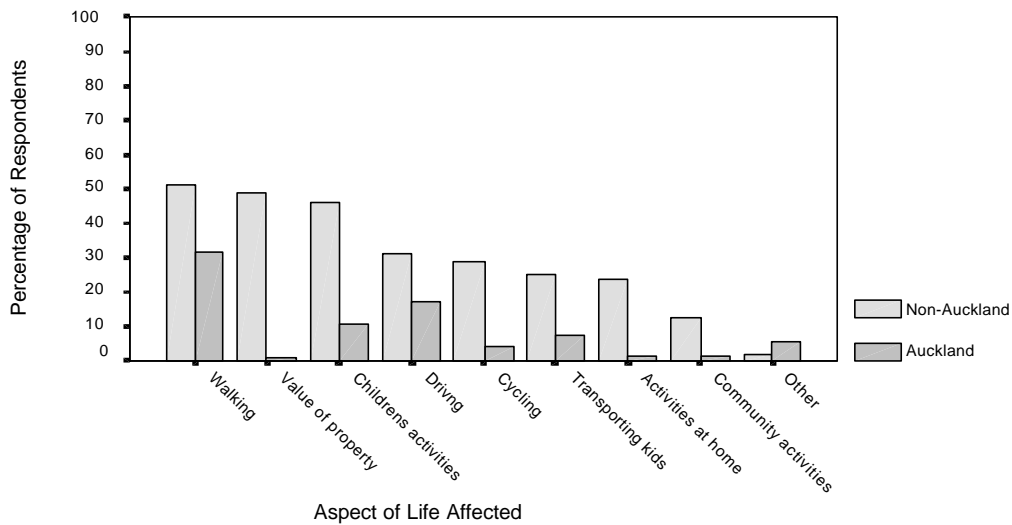
The aspects of traffic that Aucklanders rated as most dangerous were traffic speed (68%), access (39%), and traffic congestion (36%). The aspects of traffic that non-Aucklanders rated as most dangerous were traffic speed (87%), busy intersections (59%), and trucks (56%). Comments from non-Aucklanders showed that concerns about traffic speed were often related to the speed of heavy vehicles. It should be noted that more non-Aucklanders than Aucklanders mentioned almost all of the traffic issues as being dangerous (see Figure 2).



*Figure 2. Percentage of Aucklanders and Non-Aucklanders mentioning dangerous aspects of traffic and roads*

The activities that were most affected by the traffic danger for Aucklanders were walking, driving, and children's activities (see Figure 3). For non-Aucklanders the most affected aspects of their lives were walking, children's activities, and the value of their

property. Comments about property value generally related to the fact that it was hard to sell a property on a road with so many heavy vehicles. Again, it is notable that many more non-Auckland respondents mentioned traffic danger as affecting their lifestyle than Aucklanders.

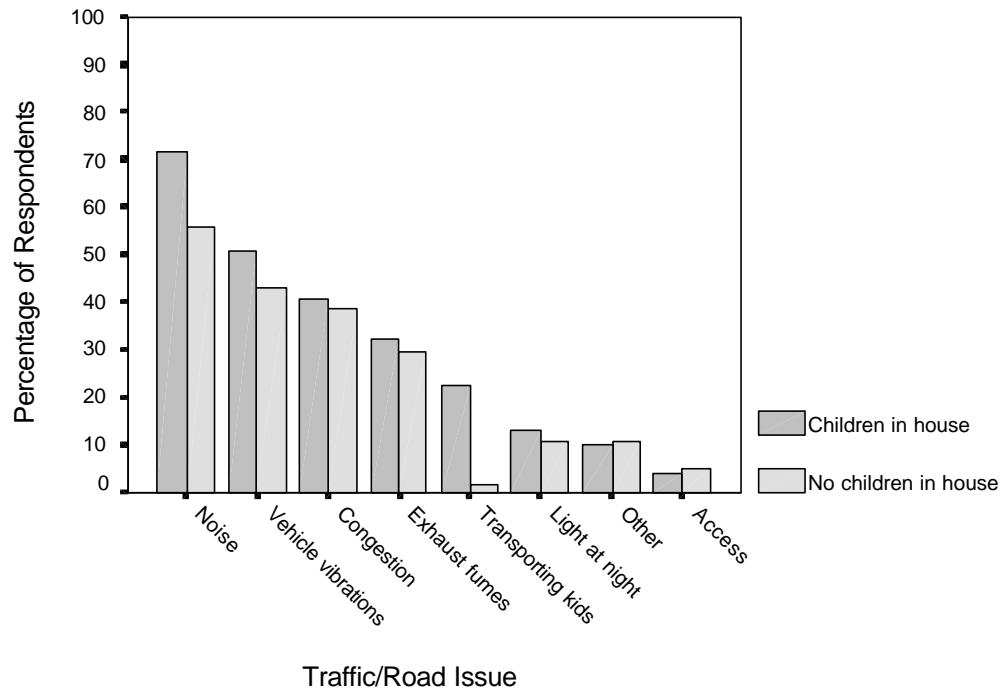


*Figure 3. Percentage of Aucklanders and Non-Aucklanders mentioning aspects of their lives affected by the danger associated with roads and traffic*

### ***Perceptions of Heavy Vehicles Compared to Other Traffic Issues – Nuisance***

The second set of analyses focused on perceptions of traffic nuisance. There were few demographic differences in terms of ratings of traffic nuisance. However, households with children were more likely to rate the traffic as a nuisance (median rating of 7.0), than households without children (median rating of 6.0). This difference was statistically significant (Mann-Whitney U = 6282.500, z = -2.402, p < 0.05).

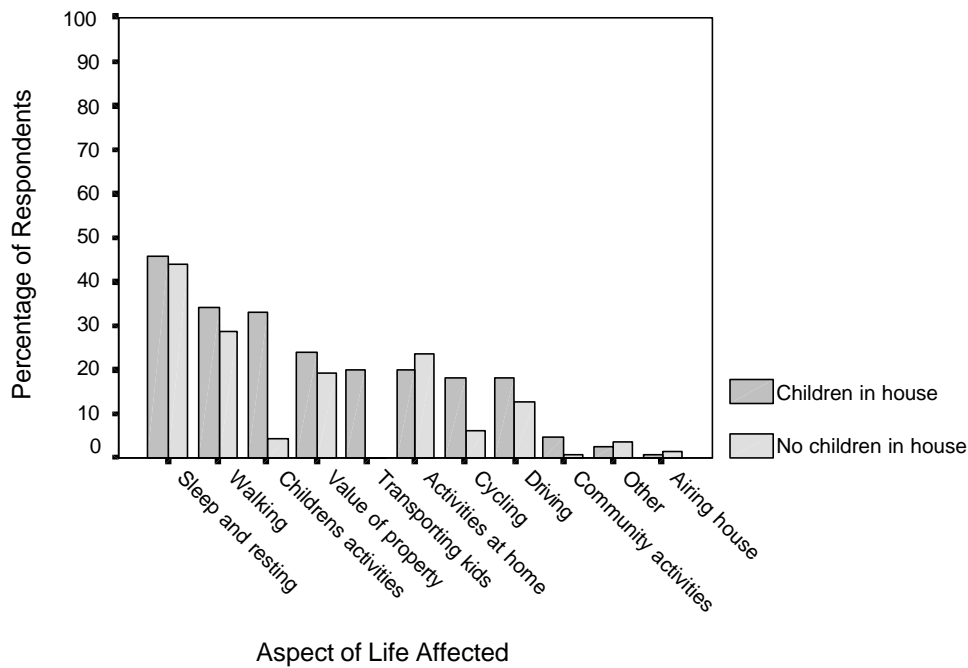
The main issues relating to traffic nuisance for both households with children and those without were traffic noise (often noted as truck noise), truck and general traffic vibrations, and congestion (see Figure 4). However, households with children were significantly more likely to state that traffic noise was a nuisance ( $\chi^2 = 6.604$ , df = 1, p < 0.05).



*Figure 4. Percentage of households with children and households without children mentioning nuisance aspects of traffic/roads*

Finally, respondents were asked to indicate whether their life was affected in any way by the nuisance caused by the traffic and roads in their neighbourhood. Both households with children and those without rated sleeping and resting as the activity most affected by the traffic nuisance (45.8% of those with children, and 43.9% of those without). Walking was the second most affected activity for both groups (34.2% of those with children, and 28.8% of those without) (see Figure 5). The only clear difference between these groups was with regard to activities that involved children. Households with children (18.3%) were more likely to say that their cycling activities were affected by the nuisance caused by the traffic than those without (6.1%). This result was statistically significant ( $\chi^2 = 9.027$ ,  $df = 1$ ,  $p < 0.01$ ). There was also a difference between groups for mentioning that children's activities were affected by the traffic nuisance (33.3% of households with children, compared to 4.6% of those without). This result was statistically significant ( $\chi^2 = 34.910$ ,  $df = 1$ ,  $p < 0.01$ ).





*Figure 5. Percentage of households with children and households without children mentioning aspects of their lives affected by the nuisance associated with roads and traffic*

### ***Perceptions of Heavy Vehicles Compared to Other Traffic Issues – Effect on Property***

The next set of analyses concerned the effects of traffic on the respondents' property. Homeowners were asked to rate how much the traffic and roads in their area affected their property. Analyses showed that Aucklanders rated the effect of traffic on their property as significantly lower than other cities (Kruskal Wallis = 8.059, df = 3,  $p < 0.05$ ). In addition, older respondents (over 60 years) also rated the effect of traffic as lower. Overall, the most commonly mentioned issue relating to the effect of traffic on property was loss of property value (59.35% of those who owned their own home) and the second most common was loss of access (42.58% of those who owned their own home). Analyses by city showed that Aucklanders (47.9%) were less likely to state that the traffic and roads affected their property value than Gisborne residents (75.6%), Mt Maunganui residents (63.2%), and Whangarei residents (62.5%). However, residents in Auckland (56.3%) and Mt Maunganui (57.9%) were more likely than those living in Whangarei (41.7%) and Gisborne (12.2%) to mention that the traffic and roads in their area affected access to their property. Few people planned any changes to their property as a result of these concerns.

### ***Perceptions of Heavy Vehicles Compared to Other Traffic Issues – Effect on Community***

Few respondents felt that the traffic and roads affected the sense of community in their area in any notable way. Mt Maunganui residents were more likely to state that the traffic affected their community. People on this road often noted that they did not know their neighbours.

### ***Perceptions of Heavy Vehicles Compared to Other Traffic Issues – Effect on Environment***

One hundred and fifteen respondents (45.1% of the total sample) indicated that they had some concern about the effect of the traffic in their area on the environment. A greater number of Aucklanders stated that they were concerned about the affect of the traffic on the environment, (55%, compared to 45.6% of people from Gisborne, 41.7% of those from Mt Maunganui, and 18.6% of those from Whangarei). This was a statistically significant result ( $\chi^2 = 17.063$ ,  $df = 3$ ,  $p < 0.01$ ). Aucklanders were more likely than residents in other cities to mention that they thought that traffic fumes were an environmental issue (50.8%, compared to 32.4% of Gisborne residents, 33.3% of Mt Maunganui residents, and 18.6% of Whangarei residents). By comparison a total of 27.9% of those living in Gisborne stated that noise was an environmental concern for them, compared to 14.2% of those living in Auckland, 16.7% of those living in Mt Maunganui, and 9.3% of those living in Whangarei. Women were more likely to mention environmental concerns than men.

### **Effects of Heavy Vehicles on Lifestyle and Behaviour**

The third objective of this research was to assess the effects of heavy vehicles on residents' lifestyle and behaviour.

#### ***Perceptions of Heavy Vehicle Volume***

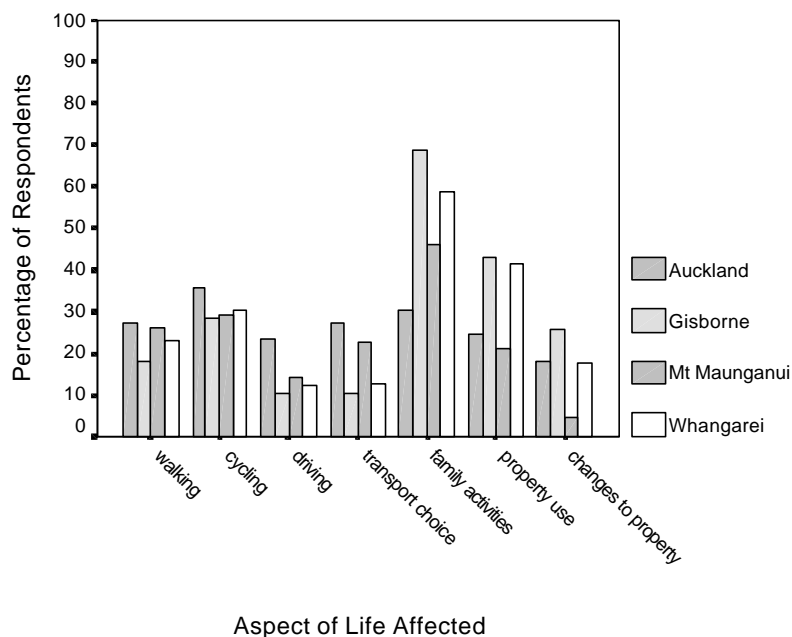
Firstly, it was of interest to the research group to examine the relationship between residents' perceptions of heavy vehicle volume on their roads and the actual heavy vehicle volumes. These analyses showed that respondents' perceptions of heavy vehicle volume bear little relation to the actual volume of traffic they experience on their road. There was no correlation between the number of heavy vehicles on the road and how heavy residents perceived the heavy vehicle traffic to be. Because perceived volume and actual volume did not correlate well, it was of interest to establish what factors influenced perceived volume. Analyses showed that perceived heavy vehicle volume was more strongly related to lifestyle factors such as where respondents lived (Aucklanders were less likely to rate the heavy vehicle volume as heavy than other respondents), whether they had children, and how they used the road (for example, did they cycle).

In addition, perceived, rather than actual, heavy vehicle volume was significantly related to respondents' ratings of overall traffic danger (Co-efficient = 0.2493,  $p < 0.001$ ), nuisance (Co-efficient = 0.2357,  $p < 0.001$ ), and heavy vehicle safety (Co-efficient = 0.3947,  $p < 0.001$ ). This means that if respondents perceived the heavy vehicle volume to be higher they were more likely to state that the traffic overall was dangerous or a nuisance and that heavy vehicles were unsafe. However, there was no significant relationship between actual heavy vehicle volume and how respondents rated overall traffic danger and nuisance and the safety of heavy vehicles.

### *Specific Effects of Heavy Vehicles on Lifestyle*

The specific effects of heavy vehicles were assessed by asking respondents if, and how, heavy vehicles affected aspects of their lives (such as walking, driving, and household activities).

As Figure 6 shows, the most frequently mentioned issues by Non-Auckland residents were the effect of heavy vehicles on household/family activities, property use, and cycling. For Aucklanders, the most frequently mentioned issues were the effect on cycling, household/family activities, transport choice, and walking. Aucklanders were more likely than residents in other cities to state that activities that are directly related to the road (e.g. walking, driving, and cycling) are affected and less likely than residents in other cities to feel that activities within their home are affected.



*Figure 6. Specific effects of heavy vehicles on residents' lives by city*

Analyses of the effects of heavy vehicles by demographics showed that households with families were significantly more likely than those without to mention that the heavy vehicles affected their transport choice for short trips, cycling, household/family activities, and use of their property ( $\chi^2 = 8.58 - 12.57$ ,  $df = 1$ ,  $p < 0.01$ ).

Finally respondents were asked what times of day they were affected by traffic. For overall traffic, residents in Auckland, Mt Maunganui, and Whangarei most frequently mentioned being affected by traffic during rush hour times (morning and evening). However, those living in Gisborne most frequently mentioned being affected by traffic at night (stating that truck noise affected them). A notable proportion of residents in Whangarei also reported being affected by traffic at night.

When respondents were asked if heavy vehicles affected them at any particular time of day, residents from all cities except for Mt Maunganui indicated that they were most affected at night.

## **Conclusions**

The objectives of this research were threefold: 1) to assess how much of a concern traffic and heavy vehicles are in comparison to other community concerns (such as access to facilities, and services); 2) to assess how much of a concern heavy vehicles are in comparison to other traffic concerns (e.g. traffic volume and speed), and; 3) to establish what the specific effects of heavy vehicles are on residents' lives and activities.

For communities on arterial roads and state highways the traffic is the main thing that residents dislike about living in the area. Heavy vehicles emerged as an important community concern for residents in Whangarei and Gisborne. The dislike of heavy vehicles in these cities appeared to cut across a wide range of people but they were most disliked by women, households with children, and people at home during the day.

In comparison to other traffic issues, heavy vehicles were not perceived as particularly dangerous with traffic speed being the biggest danger related concern. However, if residents felt that the heavy vehicles were speeding through their area then they tended to consider them very dangerous. Heavy vehicles were probably the biggest nuisance factor mentioned by residents and were the biggest contributor to complaints about vehicle noise and vibrations. In addition, comments about exhaust fumes often related to heavy vehicles. They were also the major contributor to the perceived effect of traffic and roads on property values. Many Gisborne and Whangarei residents felt that they would have difficulty selling their home because of the heavy vehicles. In addition, heavy vehicles were the main contributor to environmental concerns in Gisborne, where residents felt that their noise affected the environment. It is clear that while traffic speed is considered the most dangerous aspect of traffic from a residents' perspective, heavy vehicles represent a considerable nuisance factor because of the noise and vibrations they cause (particularly when they are travelling through residential areas at night).

The main distinction that emerged in terms of who is affected by heavy vehicles was, rather surprisingly, by city. Residents in Whangarei and Gisborne were much more likely to state that they were negatively affected by heavy vehicles than residents in Auckland and Mt Maunganui. This result is interesting because these communities, on average, had lower numbers of heavy vehicles using their roads. Therefore, there was no direct link between the number of heavy vehicles on the road and how residents felt about them. One could also theorize that these communities might have smaller numbers of vehicles overall and that therefore the heavy vehicles may tend to stand out more. However, while Gisborne did have lower overall traffic volumes, Whangarei had traffic volumes that were comparable to many Auckland roads. In addition, the traffic mix (percentage of heavy vehicles) was comparable in these cities to many of the Auckland roads.

It is therefore interesting to speculate about why respondents from Gisborne and Whangarei might have been particularly affected by trucks. It is possible that the size

and nature of the heavy vehicles that use the roads in these communities may be the cause. Residents in both communities made a large number of comments about logging trucks. Anecdotally, they seemed to consider logging trucks to be more dangerous and intimidating than other trucks. It is also possible that more trucks use the roads in these communities at night, however, the traffic count data available to the research group did not have the level of detail necessary to confirm this hypothesis. It is also possible that the increase in heavy vehicle kilometres driven per year noted by Baas and Arnold (1999) has affected these communities more than Auckland and Mt Maunganui. As Ludvigson (2002) notes, community responses to traffic issues are often mediated by a change in the traffic (e.g. increasing volume) rather than the actual traffic levels.

Other possible reasons for this result may relate to the attitudes and expectations of residents. It may be that the group of people that choose to live on state highway and arterial roads in busy centres like Auckland are somewhat self-selecting, meaning that people who strongly dislike the traffic and heavy vehicles may simply choose not to live on these roads. It is also possible that residents in larger cities have slightly different lifestyle expectations than those living in smaller centres. Many Auckland residents commented that the traffic was 'just something you had to put up with', and many Mt Maunganui residents considered that if the road wasn't so busy, then the house prices would be so high that they could not afford to live in the area. Therefore, living on the busy road gave them access to other facilities, such as beaches and shopping centres, which they would not have otherwise had. By contrast, it is possible that people living in smaller centres such as Gisborne and Whangarei choose to live there because of the slower, quieter pace of life. Therefore, this group of people may feel that the lower volume of traffic they experience is unacceptable while it may be acceptable to residents of larger cities. In any case, it is clear that responses to heavy vehicles tend to be quite community specific and, as a result, what a resident of Auckland might consider acceptable cannot be compared directly to what a Whangarei resident might consider acceptable.

This study also aimed to establish the specific effects of heavy vehicles on residents' lifestyle and behaviour. The main activities affected by heavy vehicles were household/family activities (mainly due to their noise affecting activities such as talking on the phone and hearing the television), property use (many people did not use the front of their section), and cycling. It became clear during the analyses that heavy vehicles affected Aucklanders in a slightly different way to non-Aucklanders. Aucklanders are more likely than residents in other cities to state that the activities that are directly related to the road (e.g. walking, driving, and cycling) are affected and less likely than residents in other cities to feel that activities within their home are affected. The groups whose activities seemed most affected by the heavy vehicles were respondents with children. This group was more likely to report that various family activities (such as cycling) were affected. Many people commented that their children were not allowed to ride their bikes on the road and that they had to be supervised constantly. This group of respondents also stated that their choice of transportation for short trips was also affected, with several stating that it was easier to take the car. These results clearly show that heavy vehicles do affect the activities of residents and have a notable affect on children and families.

The main effects of heavy vehicles appear to be related to the nuisance they cause. Most of the heavy vehicle issues mentioned by respondents related to vibrations and noise, particularly at night. When heavy vehicles were considered dangerous it was generally because residents believed they were speeding, or because the residents were concerned for the safety of their children.

While this study clearly shows that the perceived effects of heavy vehicles are quite community specific, it does seem likely that residents on main truck routes in communities comparable to Whangarei and Gisborne would experience similar heavy vehicle related issues. While the effects of heavy vehicles on main truck routes are difficult to mitigate, it is possible that some of the reported effects may be reduced by ensuring that heavy vehicles travel at the speed limit in residential areas as this may reduce vehicle noise and vibrations. In addition other steps could be taken to reduce the truck noise, for example by ensuring they do not rattle when empty.