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An Analysis of Freight Logistics Requirements for the Island of Ireland

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Abstract

Purpose
Freight transport and logistics plays a key role in the efficient and effective operations of supply chains and therefore makes a major contribution to overall economic activity. The location of the island of Ireland is peripheral to the EU as a whole. The relatively small overall market and its very open economies, north and south, both imply that the typical costs of transport and logistics faced by importing and exporting firms will be larger than those faced in other EU countries. The purpose of this study is to research key issues for freight movements within, as well as to and from, the island of Ireland over the next 10-15 years. It looks at existing and future demand for freight while identifying constraints for improving and developing freight in the island of Ireland.

Research approach
A range of research methods were adopted in this project. These included a questionnaire based e-survey, semi-structured interviews with key stakeholders and focus groups. This paper focuses on the questionnaire based e-survey, which had responses from 138 firms across the island of Ireland. These firms represent all major sectors in the economy including electronics, pharmaceutical, medical devices, food and beverage, building supplies and retail.

Findings and Originality
Respondents provided information concerning logistics and SC trends and issues, the impact of freight transport systems on competitiveness and possible policy recommendations based on perceived challenges, concerns and difficulties.

Research impact
This research provides illustrations concerning the effective use of e-surveys specifically in terms of questionnaire design and data analysis. Furthermore, it provides useful insights into the effective use of e-surveys as part of a wider research strategy adopting multiple methods.

Practical impact
The findings from the e-survey combined with those from the interviews and focus groups resulted in several recommendations. These recommendations relate to infrastructure, EU and national policy and regulatory issues, knowledge and skill requirements and requirements for further research.

Keywords: freight logistics, island of Ireland

Introduction and Rationale of the Study

Freight transport and logistics plays a key role in the efficient and effective operations of supply chains and therefore makes a major contribution to overall economic activity. The location of the island of Ireland is peripheral to the EU as a whole. The relatively small overall market and peripheral location implies that the typical costs of transport and logistics faced by importing and exporting firms will be larger than those faced in other EU countries. During the period of 1994-2008 the industrial structure of the Irish economy changed radically and the rate of economic growth was among the fastest of all developed economies. Likewise the economy of Northern Ireland grew steadily and was among the fastest growing regional economies in the UK. Due to a combination of factors, such as rapid population growth, high levels of construction activity and economic expansion in these years vehicle traffic has grown very rapidly. This study sets out to understand the opportunities, constraints and key issues for freight on the island of Ireland. The aim is to research key issues for freight movements

within, as well as to and from, the Island of Ireland over the next 10-15 years. The purpose of this study is to provide policy makers and industry stakeholders with an increased understanding of the role of the freight industry and therefore influence policies that act to increase the competitiveness of the industries on the island of Ireland, enabling them to compete more effectively in an ever more competitive international market. Therefore the objectives of this study are to: (a) establish a baseline of current freight characteristics and projections for the future based on economic and supply chain contexts; and (b) identify opportunities, constraints and key issues for improving and developing freight in the island of Ireland; and (c) develop a set of recommendations to improve the performance and efficiency of the freight and logistics services provided for the island of Ireland.

Economic and Supply Chain Context and Freight Movements on the Island of Ireland

Freight issues are multi-dimensional. They influence industries, the wider economy, and society in various ways. Freight transport is a derived demand - it exists to enable the economy to function, rather than being an end in itself. This section provides an overview of some of the key contextual issues relating to this study. The data used are derived from a variety of mainly governmental sources. For further details, readers are referred to InterTradeIreland (2008).

From 1990 onwards, the Irish economy grew at a significantly higher rate than that experienced across the rest of Europe. From 1995 to 2003 real growth in the Irish Gross National Product (GNP excludes profits and dividends repatriated to non-residents - an important flow in Ireland) was around 8 per cent per annum, remaining over 4 per cent a year since up to 2008. Northern Ireland exhibited a much lower growth rate throughout this period, broadly tracking growth rates within the rest of the UK. The expansion in economic growth in Ireland has been mirrored by the associated rapid increase in freight demand over the past 15 years. Over the last 15 years the industrial structure of the economy in Ireland changed radically. Exports of food, beverages and agricultural products grew at a relatively modest rate. Its traditional manufacturing sector was largely replaced by one specialising in modern electronic equipment, chemical, medical and pharmaceutical products, which tend to have relatively high value per unit of volume. This has meant that in physical transport volume terms Ireland has a much greater tonnage of imports than of exports, whereas in monetary value terms the imbalance is in the reverse direction. Figure 1 illustrates that the exports of goods from Ireland in 2005 exceeded its imports by €30billion (50%), though this gap is somewhat inflated by transfer pricing by multinationals. The main categories of exports are machinery (particularly computer equipment) and chemicals / pharmaceuticals (InterTradeIreland, 2008).

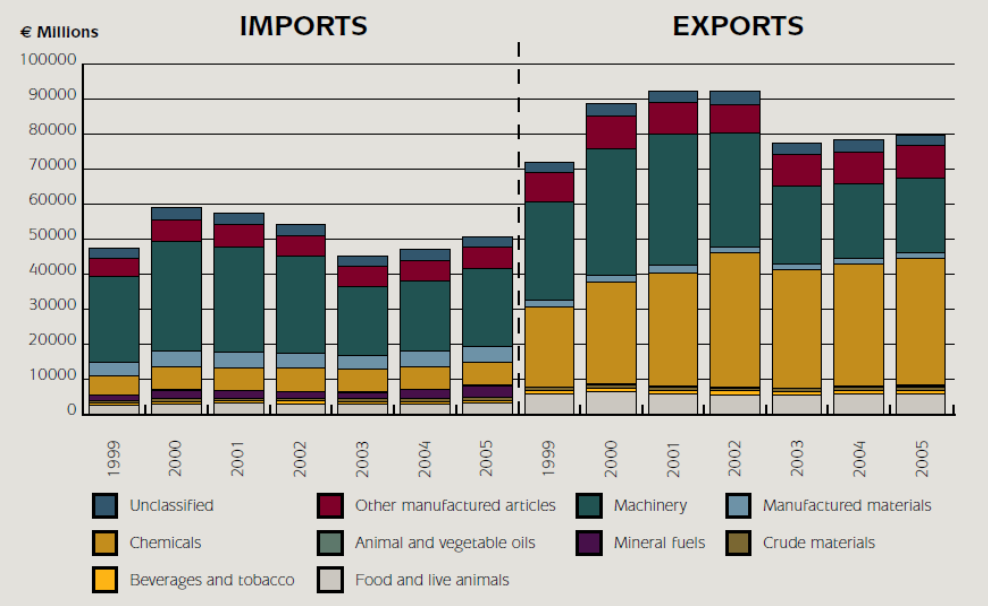


Figure 1: Irish imports and exports by category from 1999-2005 (CSO, 2007)

In Northern Ireland food and drink strongly dominate both sales within Northern Ireland and those to Britain. The sector with the highest value of exports to outside the UK is electrical equipment (see figure 2). The percentage of exports over the last ten years have been in decline for destination mainland Europe from 18% to 11%, while exports to the rest of the world have risen slightly from 16%

to 20%. For Northern Ireland by 2006, only 30% of total export value was destined for mainland Europe and the rest of the world, in contrast to 80% of the value of exports from Ireland (InterTradeIreland, 2008).

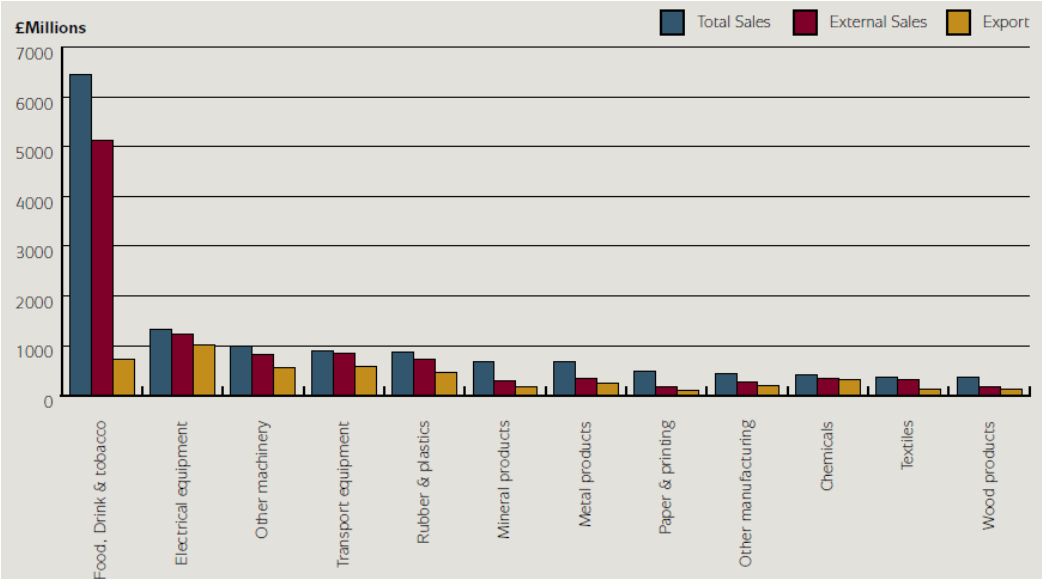


Figure 2: Sales in Northern Ireland by sector in 2005/2006 (DETI, 2007)

Businesses on the island of Ireland, like their counterparts in other countries, are subject to a range of logistical and supply chain trends. To remain competitive in international markets they must economise on inventory, minimise order lead times, provide timed delivery and offer a track-and-trace service. They have to respond to the centralisation of warehousing, wider use of hub-satellite networks, growth in direct shipment and online trading of logistical services. Companies supplying consumer markets have to meet the increasingly demanding requirements of major retailers and must often develop a multi-channel capability to guarantee high levels of reliability. McKinnon and Woodburn (1996) proposed that the volume, pattern and nature of freight movement are influenced by a wide range of logistical and supply chain trends, which are namely: the relocation of production, wider sourcing and distribution, centralisation of inventory, hub-and-spoke networks, distribution centres for imported goods, growth of online retailing, just-in-time and speed of delivery, narrowing of delivery time windows, concentration in the logistics service market, collaborative initiatives to improve vehicle optimisation, growth of out-of-hours delivery, the effects of B2B e-commerce on freight transport and the growth of factory-gate pricing, especially in the retail supply chain.

There are, however, clear differences between the interests and perceptions of some of the industrial firms (the users) and those of the third party logistics providers (3PL) or transport operators (the providers of logistics and transport services to the users). For some users, particularly those in multinational corporations, their continuing existence on the island of Ireland is determined much more directly by: government taxation policies; labour cost differentials – allowing for skill levels; global corporate strategies and other factors that are a long way removed from transport issues. This certainly does not imply that the costs and quality of freight transport are ultimately unimportant to their business but rather that many such firms employ 3PLs to do the worrying about logistics management and requirements for transport services; this provides them the freedom to concentrate on their core business (InterTradeIreland, 2008).

Methodology

Given the nature of this research, which is to identify the freight requirements of major industrial sectors and the logistic structures to best address these requirements, a triangulation of different methods was used. Thus, the research aims to combine quantitative and qualitative approaches in order to achieve a rich and complex description of the specific research in consideration of time and source constraints. A survey, semi-structured interviews and focus groups were identified as useful instruments in order to identify freight requirements and logistics structures adequately.

This paper focuses on the questionnaire based e-survey of companies operating in the island of Ireland. A pre-tested survey instrument was sent to the sample frame of 2000 companies (including large multinationals as well as small and medium sized indigenous companies), randomly selected from established industrial databases across all sectors. Questionnaire questions included closed-ended questions, e.g. on freight importance to competitiveness, freight service assessment, overall internal and external impacts on transportation needs, sector differences and company details. The survey has been pre-tested and pilot-tested with a sample of business and academic professionals to ensure that the questionnaire was sound. This resulted in minor changes in question wording and questionnaire restructuring. The questionnaire was set-up online and has been administered by e-mail explaining the rationale of the research and including a link to the questionnaire. Follow-up approaches such as emails with a link to the online questionnaire and phone interviews have been used in combination to improve results quality and sample representativeness. Using multiple modes of survey delivery generate a higher response rate than using one method alone (Dillman, 2000). The survey had responses from 138 firms and individuals, which represents a response rate of 6.9%. The survey was conducted over a 3-month period from the time of initial contact to beginning of the analysis. The surveys were tested for statistically significant differences in the responses of early and late returned surveys. No significant differences were found, suggesting that the sample is representative of the population.

Survey Findings

The e-survey presented in the following has obtained 138 responses. These are mainly from freight transport customers such as logistics companies, multinational distributors and retailers. The sample consists of 42.6% of indigenous firms, 39% subsidiaries of companies with headquarters outside of Ireland and 2.9% are subsidiaries of Irish companies. In terms of firm size, 40.7% of respondents employ more than 200 employees. 22% of respondents are resident in Northern Ireland and 78% in Ireland.

Almost all respondents agree on the importance of a high quality freight transportation system to ensure competitiveness (see figure 3). When comparing the mean values of Ireland (X_{IRE}=4.9) and Northern Ireland (X_{NI}=4.79) with the total mean value (X=4.88), the difference is slightly significant (p=9.5%; F=22.77).

Mean = **4.86** Std deviation = **0.37**
Median = **5.00**
Min = **3.00** Max = **5.00**

No importance	**0**	**0.0%**	0.0%
Little importance	**0**	**0.0%**	0.0%
Medium importance	**1**	**0.7%**	0.7%
Quite important	**17**	**12.7%**	12.7%
Very important	**116**	**86.6%**	86.6%
Total	**134**	**100.0%**	

	How important is the freight transport system to the country's business competitiveness?
Northern Ireland	**4.79**
Republic of Ireland	**4.90**
Total	**4.88**

p = **9.5%** ; F = **2.77** (**LS**)

Figure 3: Importance of Freight Transport for Competitiveness

In general, 58.6% of the sample indicated that transport does not positively impact on competitiveness (see figure 4). Interestingly, 57.1% of companies in Northern Ireland experience a positive effect on competitiveness while in Ireland 65.3% of firms do not see an improved competitiveness with the current transport system.

Yes	**55**	**41.4%**
No	**78**	**58.6%**
Total	**133**	**100.0%**

58.6% 41.4%

	Yes	No	Total	
Northern Ireland	**16**	**12**	**28**	57.1% 42.9%
Republic of Ireland	**35**	**66**	**101**	34.7% 65.3%
Total	**51**	**78**	**129**	39.5% 60.5%

p = **3.1%** ; chi2 = **4.64** ; dof = **1** (**S**)

Figure 4: Current Transport System's Effect on Competitiveness

Many of the respondents believe that they receive a good freight service only sometimes or rarely. Overall, 4.4% of respondents rarely get good freight service. 37% indicate that they sometimes experience a good service, while 48.1% get a good service often and 10.4% very often. The subsamples for Ireland (X_{IRE}=3.70) and Northern Ireland (X_{NI}=3.46) show a slightly significant difference (p=11.8¸ F=2.42) (see figure 5).

Mean = **3.64**
Median = **4.00**
Min = **2.00** Max = **5.00**

Never	**0**	**0.0%**	0.0%
Rarely	**6**	**4.4%**	4.4%
Sometimes	**50**	**37.0%**	37.0%
Often	**65**	**48.1%**	48.1%
Very often	**14**	**10.4%**	10.4%
Total	**135**	**100.0%**	

	Do Irish businesses receive a good freight service?
Northern Ireland	**3.46**
Republic of Ireland	**3.70**
Total	**3.65**

p = **11.8%** ; F = **2.42** (**LS**)

Figure 5: Quality of Freight Services

In term of freight service value for money (figure 7) and its ability to meet SC needs (figure 6), most respondents rate freight service on the island of Ireland as being adequate or good. Only a small number rate the service in either category very highly or badly. There is furthermore no significant difference between the subsamples (Ireland X_{IRE}=3.34; and Northern Ireland X_{NI}=3.26) and the entire sample (X=3.33).

Mean = **3.35**
Median = **3.00**
Min = **1.00** Max = **5.00**

Not at all	**2**	**1.5%**	1.5%
Mainly not	**16**	**12.0%**	12.0%
It depends	**52**	**39.1%**	39.1%
Mainly yes	**59**	**44.4%**	44.4%
Totally	**4**	**3.0%**	3.0%
Total	**133**	**100.0%**	

	Is that service adapted to your supply chain needs?
Northern Ireland	**3.26**
Republic of Ireland	**3.34**
Total	**3.33**

p = **62.3%** ; F = **0.25** (**NS**)

Figure 6: Level of Freight Transport Adaptation to SC needs

In line with the results above above, companies are seldom very dissatisfield (2.3%) and very satisfied (4.5%) with the value for money they receive from freight services (see figure 7). Most respondents answers tend to fall into the categories of dissatisfied (25.8%), neither satisfied or dissatisfied (28.8%) or satisfied (38.6%). There is moreover no significant difference between the subsamples (Ireland X_{IRE}=3.19; and Northern Ireland X_{NI}=3.12) and the entire sample (X=3.17).

Mean = **3.17**
Median = **3.00**
Min = **1.00** Max = **5.00**

Very dissatisfied	**3**	**2.3%**	2.3%
Dissatisfied	**34**	**25.8%**	25.8%
Neither satisfied nor dissatisfied	**38**	**28.8%**	28.8%
Satisfied	**51**	**38.6%**	38.6%
Very satisfied	**6**	**4.5%**	4.5%
Total	**132**	**100.0%**	

	What is your assessment of the current freight service in terms of value for money?
Northern Ireland	**3.12**
Republic of Ireland	**3.19**
Total	**3.17**

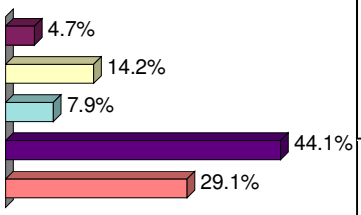
p = **73.2%** ; F = **0.11** (**NS**)

Figure 7: Freight Service Value for Money

Vehicle loading factors are likely to increase slightly (X=3.77). Most respondents indicate that there will be a small (44.1%) to large (29.1%) increase to lorry load factors, while 7.9% of respondents see no change and only 14.2% and 4.7% see a small to large decline respectively (see figure 8). When comparing the mean values of the two subsamples (Ireland X_{IRE}=3.87; and Northern Ireland X_{NI}=3.42) to the overall mean value, a slight significant difference can be observed (p=8.1%; F=3.91) with Northern Ireland firms indicating a smaller increase.

Mean = **3.79** 'Small increase'
Median = **4.00**
Min = **1.00** Max = **5.00**

Large decline	**6**	**4.7%**
Small decline	**18**	**14.2%**
No Change	**10**	**7.9%**
Small increase	**56**	**44.1%**
Large increase	**37**	**29.1%**
Total	**127**	**100.0%**



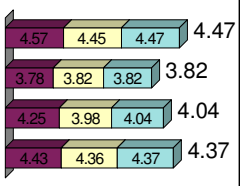
	How are lorry load factors likely to change over the next 10 years?
Northern Ireland	**3.42**
Republic of Ireland	**3.87**
Total	**3.77**

p = **8.1%** ; F = **3.01** (**LS**)

Figure 8: Future Road Haulage Vehicle Loading Factors

Most respondents indicate that road freight costs (X=4.47) are more likely to increase, followed by air freight (X=4.37), sea freight costs (X=4.04), and rail freight costs (X=3.82). There is a slight significant difference in sea freight mean values for Northern Ireland (X_{NI}=4.25) and Ireland (X_{IRE}=3.98) (p=11.7%; F=2.43) indicating that companies in Northern Ireland expect sea freight costs to rise faster.

	Northern Ireland	Republic of Ireland	**Total**
Road	**4.57**	**4.45**	**4.47**
Rail	**3.78**	**3.82**	**3.82**
Sea	**4.25**	**3.98**	**4.04**
Air	**4.43**	**4.36**	**4.37**



Is your company based in / Road p = **49.7%** ; F = **0.48** (**NS**)
Is your company based in / Rail p = **82.0%** ; F = **0.04** (**NS**)
Is your company based in / Sea p = **11.7%** ; F = **2.43** (**LS**)
Is your company based in / Air p = **72.9%** ; F = **0.12** (**NS**)

Figure 9: Expectations of Freight Costs to Change within the next 10 years

Moreover, freight transport can be linked to customer service performance. The survey has identified that on time delivery (X=4.6), product availability (X=4.47), flexibility in resolving problems (X=4.23), as well as length (X=4.22) and consistency (X=4.20) of order cycle time are main drivers for good customer service. Surveyed companies indicated that the importance of on time delivery increases in future scenarios (X=4.79). Figure 10 below outlines challenges and concerns voiced by survey participants in terms of the transport and logistics services that will be required.

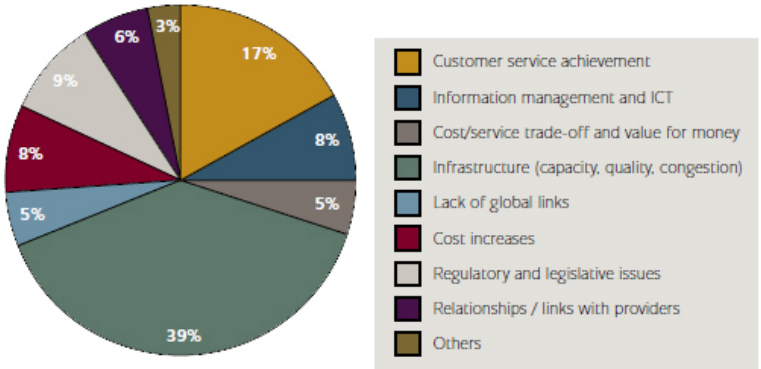
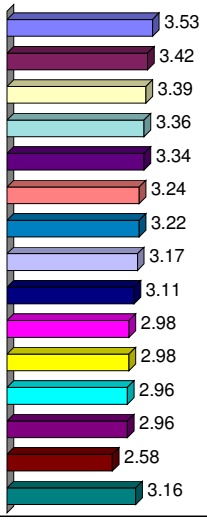


Figure 10: Challenges of Transport and Logistics Services

Most respondents cite infrastructure (39%) as the single most inhibiting factor for efficient transport and logistics services, followed by customer service target achievements (17%). Regulatory and legislative issues (9%), information and communication technology (ICT) (8%) and cost increases (8%) are further inhibitors among others outlined in figure 10. Transportation needs on the island of Ireland are currently mainly impacted by transport outsourcing initiatives (X=3.53), globalisation of supply chains (X=3.42), shortening of product life cycles (X=3.39), just-in-time deliveries (X=3.36) and centralisation of distribution (X=3.24) among others (see figure 11 below). Global supply chains (X=4.27), however, will more strongly impact on transportation needs in the short to medium-term future, followed by green logistics pressures (X=4.18), ICT developments (X=4.14), road user charging (X=4.03) as well as more just-in-time deliveries (X=3.99).

Elements impacting transportation needs at present

	Mean
Outsourcing of transport	**3.53**
Globalisation of supply chains	**3.42**
Shortening product life cycles	**3.39**
Smaller and more frequent drops / JIT	**3.36**
Overnight distribution	**3.34**
Centralisation of distribution	**3.24**
Increased direct delivery	**3.22**
Outsourcing of manufacturing	**3.17**
ICT developments	**3.11**
Collaboration to improve vehicle utilisation	**2.98**
Increased use of cross-docking	**2.98**
Road user charging	**2.96**
Increasing green logistics pressures	**2.96**
Online retailing	**2.58**
Total	**3.16**



Elements impacting transportation needs in 10 years

	Mean
Global supply chains	**4.27**
Green logistics pressures	**4.18**
ICT developments	**4.14**
Road user charging	**4.03**
Smaller and more frequent drops / JIT	**3.99**
Outsourcing of transport	**3.96**
Overnight distribution	**3.95**
Shortening product life cycles	**3.95**
Centralised distribution	**3.92**
Collaboration to improve vehicle utilisation	**3.82**
Outsourcing of manufacturing	**3.80**
Increased direct delivery	**3.75**
Increased use of cross-docking	**3.69**
Online retailing	**3.52**
Total	**3.93**

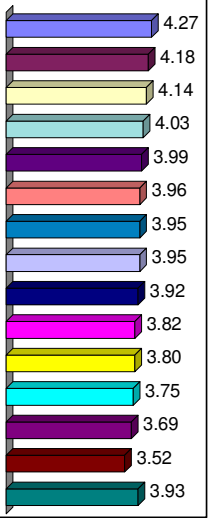


Figure 11: Elements impacting transportation needs

Finally, companies were asked to give recommendations in terms of policy measures and investments that can provide for these requirements. An overwhelming majority cited infrastructure improvements (41%), followed by cost minimising initiatives (13%), enhanced global links (13%) environmental policies (12%) among others (see figure 12 below).

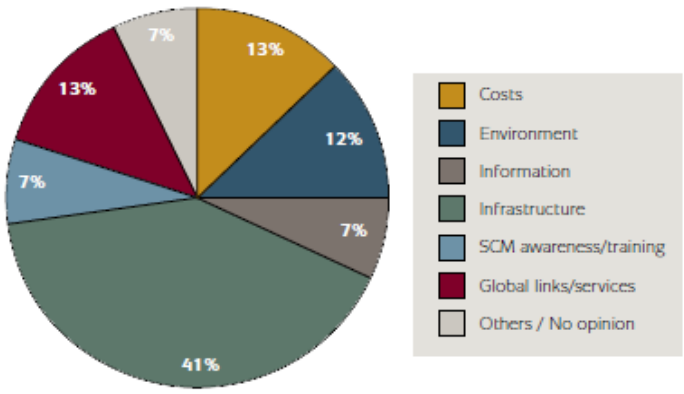


Figure 12: Policy Recommendations

Conclusions

Based on the study the most serious issues faced by firms on the island of Ireland are highlighted as: inadequate infrastructure, fuel prices and costs, peripherality and traffic congestion. These issues affect all transport sectors although they impact on road haulage the most, particularly in Ireland. Investing in better infrastructure was seen as the most important role for government relating to

transport. Other issues with high ranking were: providing freight grants, updating the planning system and improvements to traffic management.

There are important firms servicing the domestic sector, such as the retail multiple sector plus its suppliers, where efficient logistics and supply chain management are one of the main keys to profitability and where logistics initiatives, such as the move to centralised distribution systems, are central to maintaining competitiveness. For the electronics high-value export sector, similar issues arise but within a global rather than a national supply chain, focussed on airfreight more than on sea-freight. For such firms efficient logistics management is seen as a necessary ingredient within that business, rather than as an opportunity to obtain a competitive advantage in their marketplace.

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