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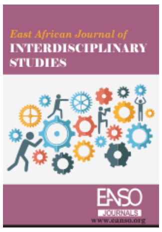

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Original Article

Strategic Mobility Plan for Employees of Coolwood SA Company

Tukashaba Shafan[1*] & *Shingiro Clement*[2]

[1] Dalian University of Technology, Ganjingzi District 116024 Dalian China.
[2] Hasselt University, Martelarenlaan 42, 3500 Hasselt, Belgium.
* Author for Correspondence ORCID ID: https://orcid.org/0009-0002-1265-475X; Email: shafantukashaba@gmail.com

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ABSTRACT

In contemporary business environments, effective management of employee mobility has become paramount for companies striving to maintain competitiveness and sustainability. Neglecting to develop suitable mobility strategies can result in decreased productivity, increased operational costs, and environmental concerns, jeopardising a company's long-term success. Coolwood SA, a middle-sized furniture production company, is planning to relocate its headquarters from Maastricht to Hasselt by 2030, necessitating the design of a sustainable and cost-efficient mobility plan for its employees. This study aims to address this challenge by crafting a tailored mobility strategy that facilitates a seamless transition to the new headquarters. Drawing on insights from literature and empirical research, this study emphasises the importance of effective mobility planning in enhancing employee satisfaction, productivity, and operational efficiency while reducing environmental impact and costs. By analysing employee profiles, mobility measures, and various scenarios, the study identifies the most suitable mobility strategy for Coolwood SA. Through rigorous cost calculations and scenario comparisons, Scenario Two emerges as the most favourable option, offering significant cost reductions and accommodating employees' diverse needs and preferences. The study's findings underscore the importance of strategic and personalised mobility planning for companies undergoing relocation or expansion. By considering factors such as employee profiles, transportation modes, and cost implications, organisations can optimise decision-making and ensure a smooth transition to new locations while promoting long-term economic success and sustainability. This research provides valuable insights and recommendations for Coolwood SA and other companies navigating similar mobility challenges, highlighting the critical role of mobility planning in achieving organisational objectives and fostering employee well-being.

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INTRODUCTION

In today's rapidly evolving business landscape, the effective management of employee mobility has become a cornerstone for companies striving to thrive and maintain a competitive edge. Conversely, neglecting to develop suitable mobility strategies can yield severe consequences, jeopardising productivity, financial stability, and long-term success.

Coolwood SA, a middle-sized company specialising in household furniture production, is currently based in Maastricht. However, with plans to relocate its main branch to Hasselt by 2030, the company faces the imperative task of designing a sustainable and cost-efficient mobility plan for its employees. This study endeavours to address this challenge by crafting a tailored mobility strategy that facilitates a seamless transition from the existing Maastricht site to the new Hasselt headquarters (Van Malderen et al., 2012; Dickinson et al., 2003; Soder & Peer, 2018; Enoch & Potter, 2003; Vanoutrive et al., 2012).

The significance of effective mobility planning cannot be overstated. Poorly designed mobility plans can lead to decreased staff productivity, increased operational costs, and environmental concerns, ultimately impeding a company's growth trajectory and success (EPA, 2020), (BEIS, 2019), (Sutton-Parker, 2021). Without adequate mobility strategies in place, employees may encounter obstacles in their daily commute, ranging from limited transit alternatives to lengthy trip durations, resulting in heightened stress, fatigue, and a compromised work-life balance (Paladugula & Rathi, 2013).

Hence, the overarching objective of this study is to develop a comprehensive and customised mobility plan for Coolwood SA personnel. This plan aims to offer employees efficient and sustainable transportation alternatives, minimise disruptions to their work-life balance, enhance productivity, and reduce operational and environmental expenses associated with commuting (Climate Change Committee, 2020). By achieving these objectives, this research endeavours to facilitate Coolwood SA's successful relocation while fostering employee satisfaction and supporting the company's long-term prosperity (OECD, 2002).

To guide the inquiry and achieve the intended outcomes, this study is framed by a set of research questions designed to uncover essential insights into employee mobility at Coolwood SA, profile employee mobility needs and preferences, identify suitable mobility measures, assess the feasibility and impact of various mobility scenarios, and determine the most cost-effective approach for employee mobility.

Through a rigorous analysis of these research questions, this study aims to provide actionable recommendations that will enable Coolwood SA to navigate its relocation process seamlessly, ensuring employee well-being, operational efficiency, and environmental sustainability in the transition to its new headquarters in Hasselt.

METHODOLOGY

Study Area

The main study area focuses on Coolwood SA, a company that has recently decided to relocate its headquarters from Maastricht to Hasselt. However, the scope of the study extends beyond the company's physical locations. It encompasses every residing place of Coolwood SA's employees, recognising the diverse geographic distribution of the workforce. By considering the residing areas of employees, the study aims to develop a comprehensive mobility plan that considers the unique commuting needs and challenges individuals face across various locations. This approach ensures that the mobility plan addresses the requirements and concerns of all employees, irrespective of their residing place,

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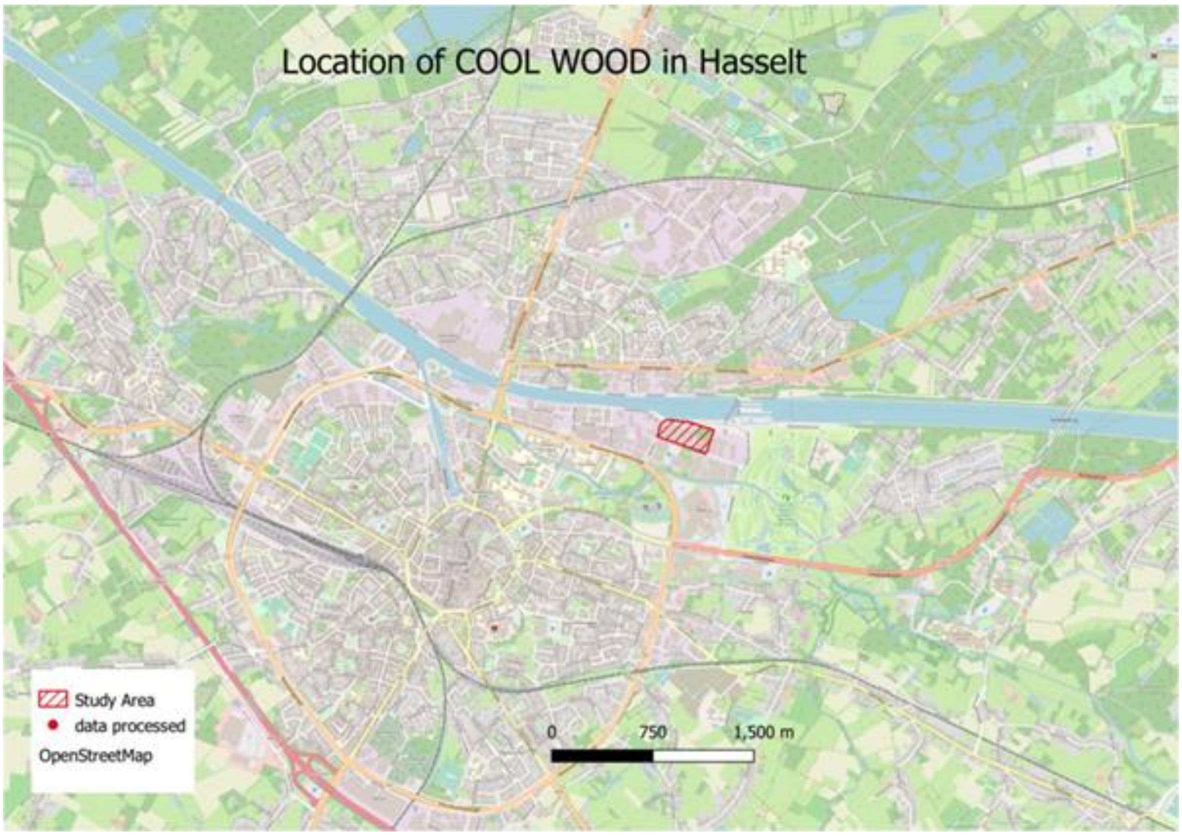
and maximises the overall effectiveness and success of the relocation process.

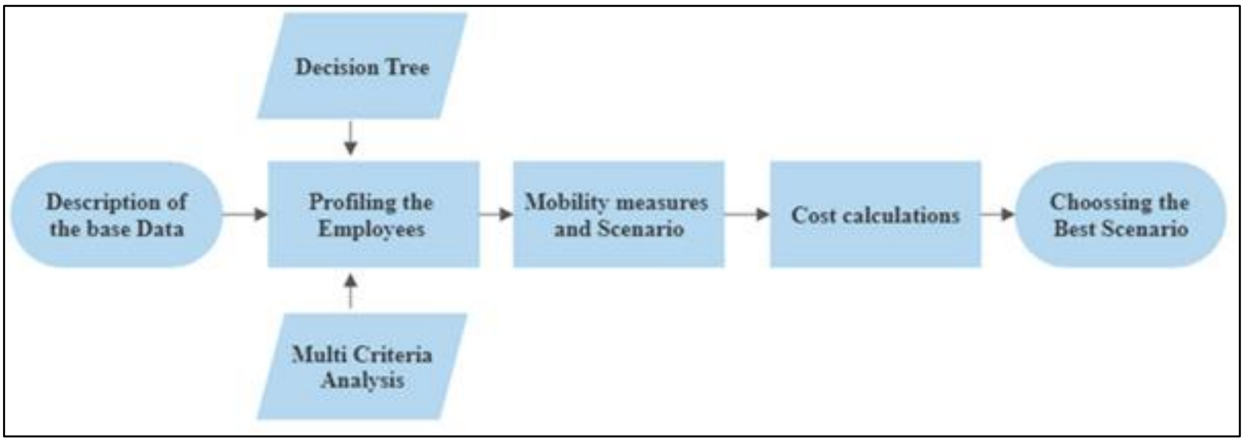
Figure 1: Location of Coolwood SA in Hasselt



Study Design

The following figure shows the study design to come up with the best personalised mobility strategy for Coolwood SA personnel.

Figure 2: The Study Design



Data Analysis and Methods

The data for this study were analysed using a mix of MS Excel and QGIS software tools. The primary data is provided first, followed by a summary of the essential information. Then, each person is profiled using a decision tree method, allowing for a systematic and organised investigation of employee attributes and preferences. In addition, the decision tree architecture incorporates a multicriteria analysis technique, allowing for a full review of numerous aspects impacting mobility decisions.

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Following the profiling and analysis step, the study moves on to create mobility strategies and construct numerous scenarios. These plans and scenarios are developed based on the data analysis findings to solve the unique mobility demands and problems related to Coolwood SA.

The following step is to calculate the expenses associated with each mobility scenario. A detailed analysis establishes the cost consequences of implementing various mobility choices. This cost study allows for the economic viability of each scenario to be assessed and the identification of prospective financial advantages and downsides.

Finally, the research identified the optimum scenario for Coolwood SA by thoroughly examining the data, profiling outcomes, mobility plans, and cost projections. Employee productivity, operational efficiency, and overall cost-effectiveness are all variables considered in this decision. The scenario chosen is considered the most appropriate and ideal choice for Coolwood SA's seamless transfer to its new headquarters in Hasselt.

DATA ANALYSIS

Description of the Base Data

The study will first describe the base data used to start designing a sustainable and cost-efficient mobility plan for Coolwood SA's employees. This would help to come up with the best mobility plan for employees.

Residence of Employees

The data of Coolwood SA company shows out of 299 employees, 28% reside in Hasselt City, and 15% reside in Maastricht. In addition, 5% and 4% of employees live in Bilzen and Brussels respectively. The remaining 48% of the employees are registered in other municipalities in the Flemish region of Belgium. *Figure 3* shows the distribution of living places of employees in different cities and municipalities.

Gender Distribution

The data shows Coolwood SA has 164 male employees, covering 55%. The remaining 45% are females, with 135 in number.

Table 1 Gender distribution

Gender	Number	Percentage (%)
Female	135	45%
Male	164	55%
Grand Total	299	

Age Group

Coolwood SA has different employees, ranging from younger employees who are as young as 19 years old to older employees who are 50 years old. The mean Age of the employees is 32.27 years, and the median is 31 years. The value that appears most frequently in a dataset is 27 years. Considering five-year intervals in the age groups, 72 employees are younger than 25 years, 61 employees are between 26-30 years old, and 65 employees are 31-35 years old. The remaining employees are older than 35 years. *Table 2* and the charts show the age group distribution among employees of Coolwood SA.

Table 2: Descriptive Statistics of Age

AGE	
Mean	32.28
Standard Error	0.46
Median	31.00
Mode	27.00
Standard Deviation	7.99
Range	31.00
Minimum	19.00
Maximum	50.00
Count	299.00

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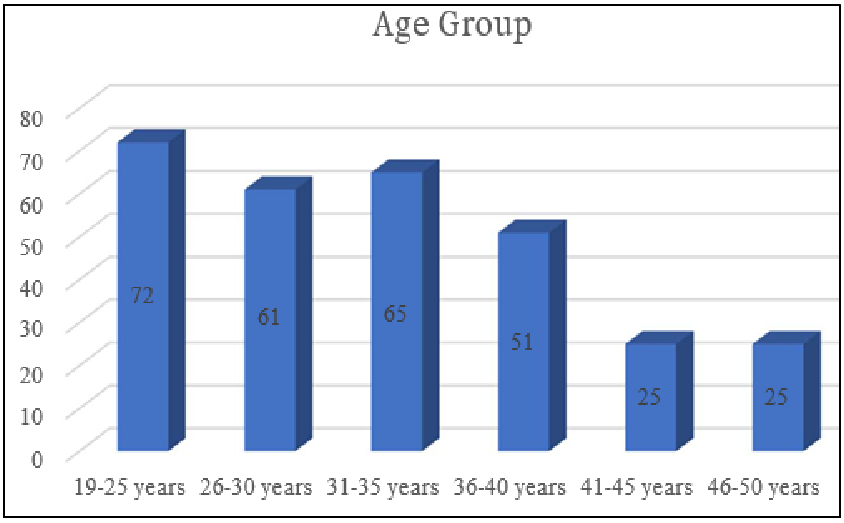
Figure 5 Age group of employees



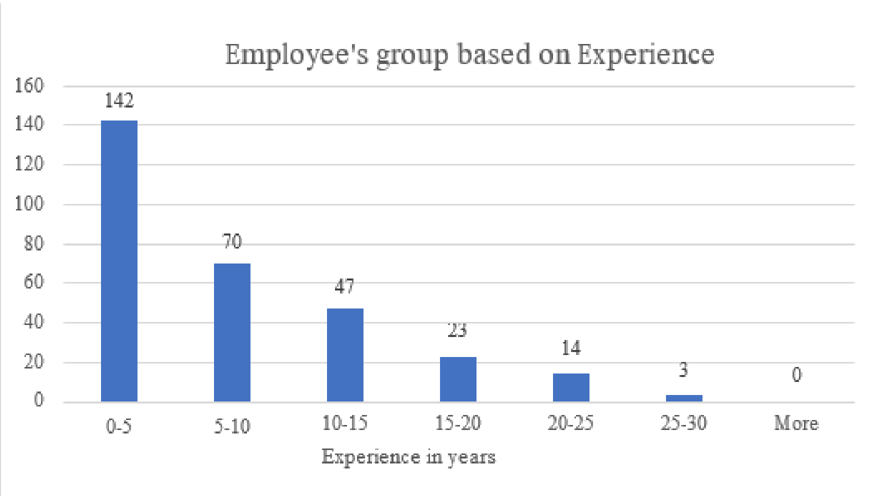
Working Experience of Employees

Employees' work experience matters significantly for a business since it can increase productivity, cut expenses, and boost leadership potential and retention of staff members. When it comes to Coolwood SA it comes with quite a wide range of experience among the employees. Starting one year, it has an employee with 30 years of working Experience. The mean years of working Experience in the company is 7.8 years, with a median of 6 years. The value that appears most frequently in a dataset is one year of working experience. *Table 3*, *Figure 6*, and *Figure 7* show the distribution of work experience among employees of Coolwood SA.

Table 3 Descriptive statistics of experience

	Experience
Mean	7.8
Standard Error	0.4
Median	6
Mode	1
Standard Deviation	6.5
Range	29.0
Minimum	1
Maximum	30
Count	299.0

Figure 7*:* Employee distribution based on experience in years



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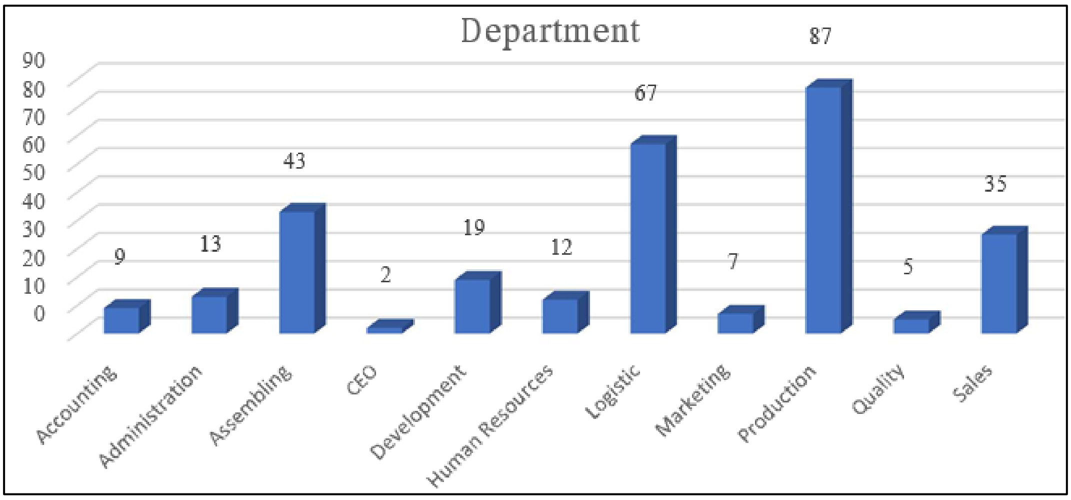
Departments

There are 11 departments within the Coolwood SA Company. Out of these, production workers cover 29% of the total employees, and logistics cover 22% of the total employees. The next line is the assembly and sales departments, which cover 14% and 12% of the total employees. The remaining are covered by Development, Administration, Human resources, Accounting, Marketing, Quality, and CEO in decreasing order. *Figure 8* shows the distribution of employees according to their department.

Figure 8 Distribution of employees among department



Profiling

It is essential to profile employees when creating a mobility plan for a business because it provides helpful information about their needs and commute habits. By learning about its employees' commute habits and preferences, a company can develop a mobility plan that meets their needs while promoting eco-friendly transportation options.

According to studies in Europe and North America, the convenient distance for biking varies from 5-15 km. (Peer, 2019; Nelson et al., 2008; Aertsens et al., 2010). Besides, the convenient distance of bike commuting significantly increased using e-bikes (Fyhri & Fearnley, 2023). Therefore, this study takes 10 km as a suitable distance for biking.

This study prepares six profiles according to the employees' shifts in the company, the possibility of working from home, and the distance the employees reside. Decision tree and multicriteria analysis methods are used to profile the employees. Profiles one, two, and three employees are those who live more than 10 km away from the company, and they are selected by using distance and travel time ratio as variables. According to several studies, (Chiu Chuen et al., 2014; Vale, 2013), travel time is a more influential variable than distance. Therefore, this paper gives 60% weight to the travel time ratio and 40% to distance. In addition, since the units of these two variables are different, normalisation and centring should be executed before doing the regression model in the multicriteria analysis method.

Based on the profiling analysis, it is determined that employees belonging to Profile One exhibit higher suitability for utilising public transport, whereas employees falling under Profile Two exhibit a moderate level of suitability. Conversely, employees characterised by Profile Three face notable challenges in effectively using public transportation options.

Profile four employees are the ones who live within 10 km distance from the company, and they appear to be the most suitable ones to use a bike. Profile five employees are night shift workers. Since there is no public transport running at night in Hasselt, it is important to

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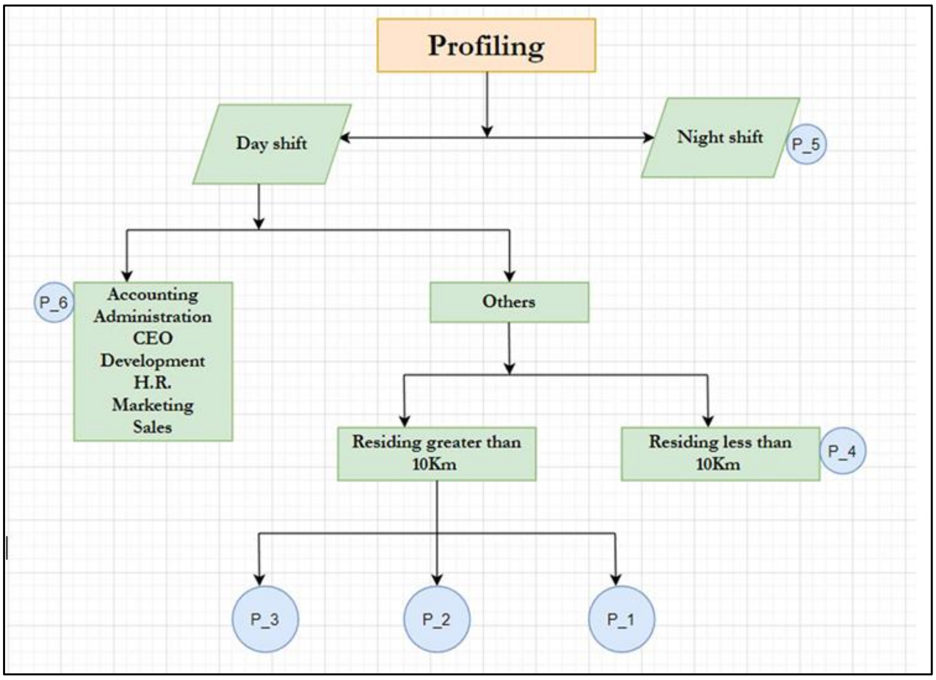
categorise them in one profile. Profile six employees are company staff categorised by their department working behaviour, and they can work from home for at least half of the working days of a year. These departments are Accounting, Administration, CEO, Development, Human Resources, Marketing, and Sales. However, for half the year, they have a secondary profile when commuting to work. Profile six employees are selected according to their working shifts and are all night shift workers. *Figure 9* shows the profiling of employees of Coolwood SA company according to the above criteria.

Figure 9 Profiling of employees of Coolwood SA



Again, *Figure 10*, *Figure 11*, *Figure 12*, and *Figure 13* show the employee Profile on the map.

Figure 10*: *Profile 1, 2 and 3 employees of Coolwood SA

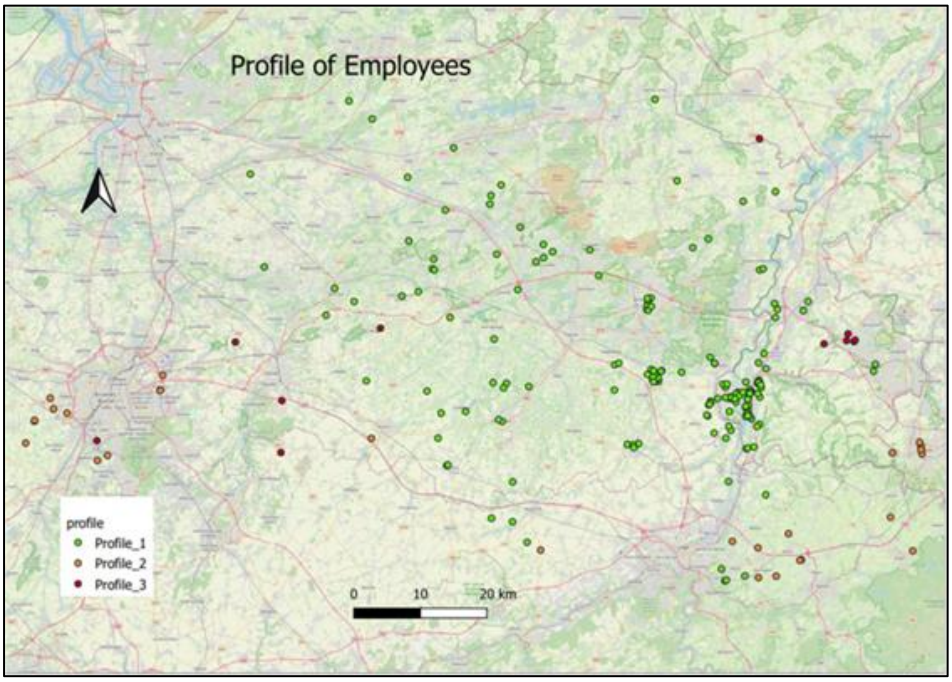


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Figure 11 Profile 4 Employees of Coolwood SA

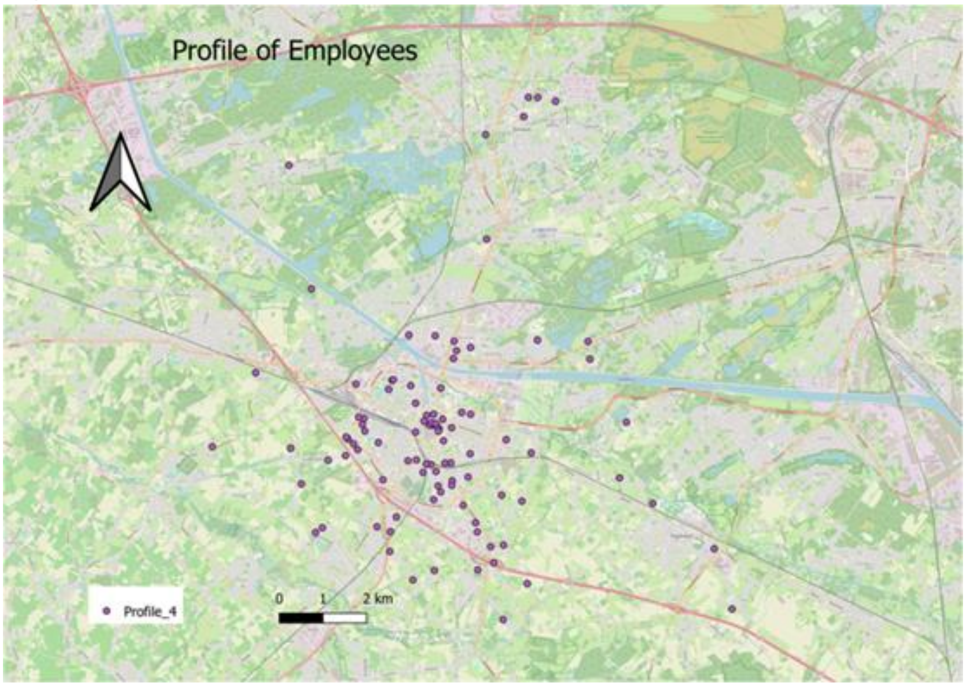

Figure 12*:* **Employees' working shift**

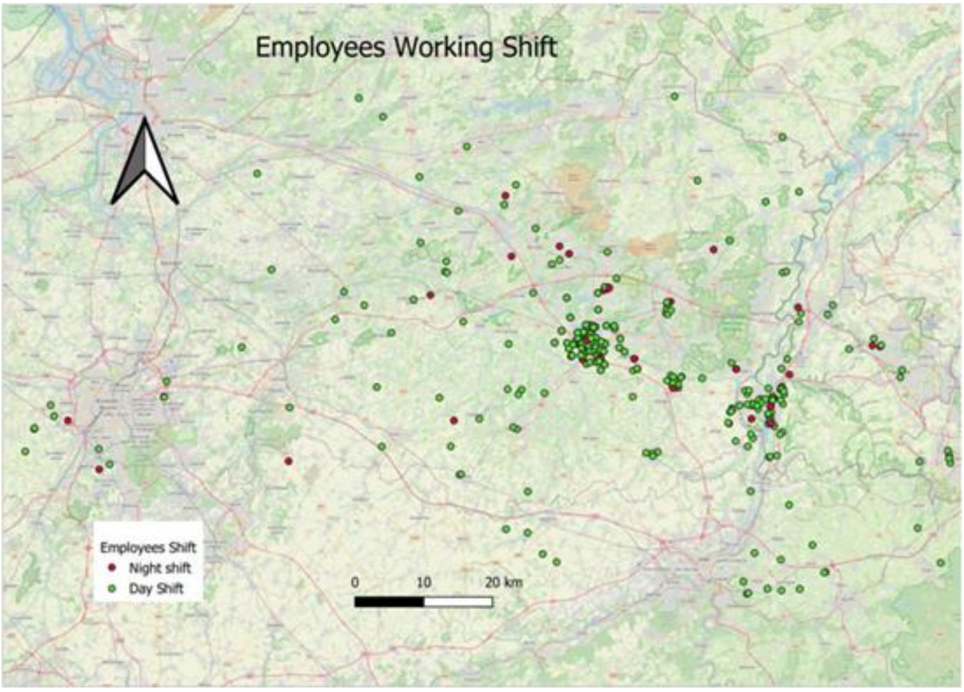

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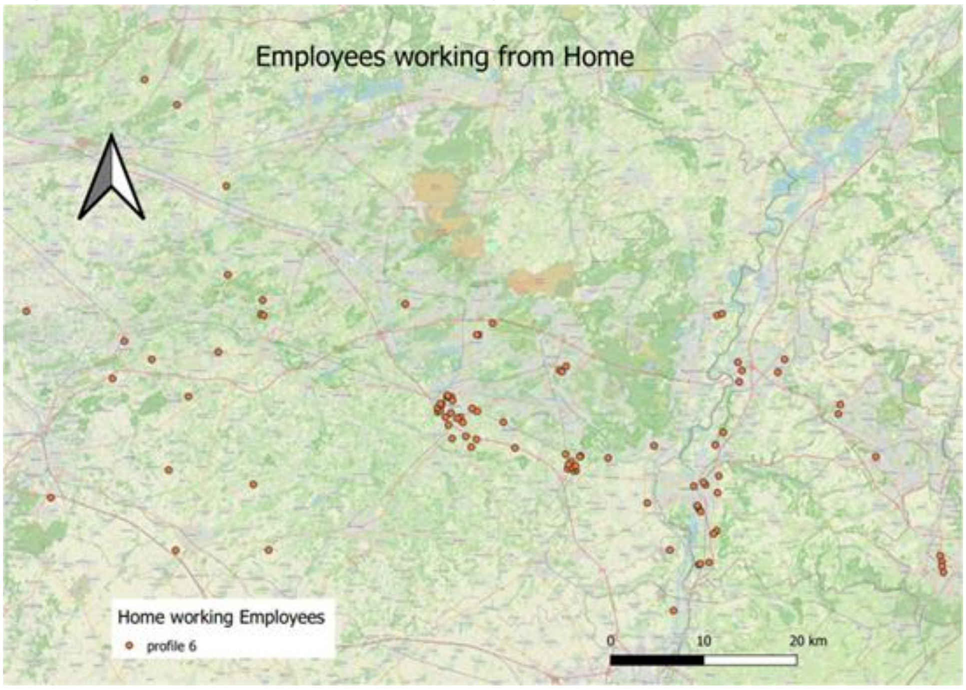
Figure 13*:* Profile 6 Employees working from home



Mobility Measures

The main objective of profiling employees is to take mobility measures. This study also provides various measures according to the Profile of each employee. The first measure is to provide an electronic bike with an umbrella for suitably profiled employees. The second measure is to provide half of and total public transport cost of employees according to their profiles. The third measure is to provide a parking lot for employees. However, the company will provide charging spots for electric cars to promote environmentally friendly vehicles. According to European Union plan to use 55% of the cars around Europe to be electric cars. The fourth measure is to provide a service bus or minibus for employees. *Table 4* summarises the mobility measures that the company can provide.

Table 4 Mobility measures

No.	Measures
1	Provide E-bike with umbrella and its yearly maintenance
2	Provide half of and total public transport cost
3	Provide a parking lot
4	Provide a service bus or minibus
5	Provide a laptop with Internet for home workers

Scenarios

Scenario 1

The combination of soft mobility-related measures and a half-priced PT card is given to employees, and these mobility measures are presented for scenario 1 in *Table 5.*

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Table 5 Measures of Scenario 1

Profile	Transportation mode	Mobility Measure
1	50% PT/50%Car	50% Yearly cost of PT fare Provide a parking lot for 100 days.
2	40%PT/60%Car	100% Yearly cost of PT fare or Provide parking lot for 120 days
3	100% Car	Provide a parking lot with a charging spot for E-cars.
4	100% Bike	Provide an E-Bike with an umbrella
5	100% Car/ Bike	Provide a parking lot with a charging spot for E-cars.
6	Car/PT/Bike	According to their secondary Profile

Scenario 2

Table 6 Measures of Scenario 2

Profile	Transportation mode	Mobility Measure
1	40% PT/60%Car	75% Yearly cost of PT fare Provide a parking lot for 70 days.
2	30%PT/70%Car	75% Yearly cost of PT fare Provide a parking lot for 140 days
3	20% PT/ 80% Car	50% Yearly cost of PT fare Provide a parking lot with a charging spot for E-cars.
4	100% Bike or Walk	Provide an E-Bike with an umbrella
5	100% Car/ Bike	Provide a parking lot with a charging spot for E-cars.
6	Car/PT/Bike	According to their secondary Profile

Scenario 3

Table 7 Measures of Scenario 3

Profile	Transportation mode	Mobility Measure
1	60% PT/40%Car	80% Yearly cost of PT fare Provide a parking lot for 50 days or provide a bus service
2	20%PT/20%Car/60% minibus	100% Yearly cost of PT fare Provide parking lot for 120 days
3	25% PT/ 75% Car	100% Yearly cost of PT fare Provide a parking lot with a charging spot for E-cars.
4	100% Bike or Walk	Provide an E-Bike with an umbrella
5	90% Car/ 10% Bike	Provide a parking lot with a charging spot for E-cars. Provide an E-Bike with an umbrella
6	Car/PT/Bike	According to their secondary Profile

Cost Calculation

The first calculation of the current scenario has to be done (see *Table 8*). Secondly, the calculation of the reference scenario has to be done (see *Table 9*). *Table 10*, *Table 11*, and *Table 12* show the cost calculation of each scenario.

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Table 8 Cost calculation of the current situation

Current Situation									
		PP cost	**PT cost**	**Cost of sickness and absence**	**Cost of Reduced production**	**Cost of Additional Parking as Environmental Tax**	**Cost of stress**	**Emission cost**	**Total Cost**
Number of employees using a private car Number of employees provided 75% PT compensation	167 249	180,835.2	492,589.8	123,738.16	112,519.68	112,873.32	236,257.84	80,109.57	1,338,923.57

Table 9 Cost calculation of the reference scenario

Reference Scenario cost									
		PP cost	**PT cost**	**Cost of sickness and absence**	**Cost of Reduced production**	**Cost of Additional Parking as Environmental Tax**	**Cost of stress**	**Emission cost**	**Total Cost**
Number of employees using a private car Number of employees provided 75% PT compensation	179 249	212,843.03	517,219.29	132,399.83	120,396.0576	124043.24	252795.9	80,109.57	1,439,807

Assumptions:

- Car ownership will increase by 7% in the year 2030.
- Parking costs will increase by 10% in the year 2030.
- Public transport costs will increase by 5% in the year 2030.

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Table 10: Cost Calculation for Scenario 1

Scenario 1								
Profile	**Number of employees**	**Parking cost**	**PT cost**	**Bike cost**	**Stress cost due to traffic**	**Emission cost**		
						Average distance	**Tone of CO_2**	**Cost**
1	146	71,672.73	116,218.48		18,714.55	498699.01	99.73980118	18,451.86
2	26	15,316.36	54,307		3,999.27	470029.15	14.10087436	2,608.662
3	8	8,640	17,350.64		2,256	211586.57	42.31731445	7,828.703
4	86	0	0	90,988		191224.12	3.059585851	566.0234
5	33	35,640	0		9,306	398304.97	79.6609948	14,737.28
6	97	21,329.75	71,343.8	28,566	1,692			
	Total	152,598.84	259,219.92	119,554.00	35,967.82			44,192.54
	Grand total	**611,533.11**						

- *The parking cost per year is 1080 Euros.*
- *The CO_2 emissions rate for motorised vehicles is 0.2 kg/ km and 0.016 kg/ km for bikes.*
- *The average cost of stress due to traffic is 282 euros annually.*
- *Bub-up Rain cover for a bike costs 109 Euros*
- *The E-bike costs 1058 Euros*
- *According to energy post.EU website, damage per ton of CO_2 costs \$185.*

Table 11 Cost calculation for Scenario 2

Scenario 2								
Profile	**Number of employees**	**Parking cost**	**PT cost**	**Bike cost**	**Stress cost due to traffic**	**Emission cost**		
						Average distance	**Tone of CO_2**	**Cost**
1	146	50,170.91	174,327.72		13,100.18	418,907.16	83.78	15,499.57
2	26	17,869.09	40,730.25		2,332.91	383,857.14	76.77	14,202.71
3	8	8,640	8,675.32		1,804.80	169,269.26	33.85	6,262.96
4	86	0	0	90,988		191,224.12	3.06	566.02
5	33	35,640	0			398,304.97	79.66	14,737.28
6	97	15,476.29	76,970.4	28,566	1,353.6			
	Total	127,796.29	300,703.69	119,554.00	18,591.49			51,268.54
	Grand total	**617,904.01**						

- *The parking cost per year is 1080 euros.*
- *The CO_2 emissions rate for motorised vehicles is 0.2 kg/ km and 0.016 kg/ km for bikes.*
- *The average cost of stress due to traffic is 282 euros annually.*
- *Bub-up rain cover for a bike costs 109 Euros*
- *The E-bike costs 1058 Euros*

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Table 12*: Cost calculation for Scenario 3*

Scenario 3									
Profile	**Number of employees**	**Parking cost**	**PT cost**	**Bike cost**	**Stress cost due to traffic**	**Service Bus cost**	**Emission cost**		
							Average distance	**Tone of CO_2**	**Cost**
1	146	35,836.36	139,462.18		9,357.27	733.646.00	199479.60	39.90	7,380.75
2	26	15,316.36	54,307		3,999.27		94005.83	18.80	3,478.22
3	8	8,640	17,350.64		1,692.00		211586.57	42.32	7,828.70
4	86	0	0	90,988			191224.12	3.06	566.02
5	33	35,640	0				398304.97	79.66	14,737.28
6	97	11,354.68	78,513.16	28,566	1,269				
	Total	106,787.40	289,632.98	119,554.00	16,317.55	733,646.00			33990.97
	Grand total	**1,299,918.9**							

- *According to the official website of European Biogas, a new E-bus costs €733,646 without operational cost.*
- *The parking cost per year is 1080 euros.*
- *The CO_2 emissions rate for motorised vehicles is 0.2 kg/ km and 0.016 kg/ km for bikes.*
- *The average cost of stress due to traffic is 282 euros annually.*
- *Bub-up Rain cover for a bike costs 109 Euros.*

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DISCUSSION AND COMPARATIVE ANALYSIS WITH OTHER STUDIES

The implementation of Scenario Two as the preferred mobility plan for Coolwood SA highlights a strategic approach to balancing cost efficiency, employee satisfaction, and environmental sustainability. This analysis aligns with findings from various studies on corporate mobility strategies.

Cost Efficiency

Scenario Two's 58.7% Cost Reduction: The significant cost reduction observed in Scenario Two is a testament to the effectiveness of promoting sustainable commuting modes, such as walking, cycling, carpooling, and public transport. This aligns with findings from studies like the one by Shaheen et al. (2009), which demonstrated that companies adopting sustainable commuting practices could reduce transportation costs by up to 50% through decreased fuel consumption and lower vehicle maintenance costs.

Comparison to Other Studies:

Telecommuting: A study by Global Workplace Analytics (2021) found that remote work could save companies approximately $11,000 per year per employee. While Coolwood SA's scenario includes telecommuting as part of the strategy, the emphasis on mixed commuting modes appears more aligned with their workforce needs and regional characteristics.

Carpooling and Public Transport: Research by Buehler & Pucher (2012) highlighted that companies promoting public transport and carpooling could achieve cost savings of around 30-40%, which supports Coolwood SA's findings, showing the effectiveness of these modes in reducing operational costs.

Employee Productivity and Satisfaction

Balancing Cost Savings and Employee Needs: The success of Scenario Two also stems from its ability to balance cost savings with employee productivity and satisfaction. Studies like the one by Gajendran & Harrison (2007) found that telecommuting and flexible work arrangements could enhance employee job satisfaction and productivity, contributing to better overall performance.

Comparison to Other Studies:

Flexibility and Work-Life Balance: According to Bloom et al. (2015), offering flexible work hours and remote work options can lead to a 13% performance increase, indicating that Coolwood SA's approach to accommodating diverse commuting needs aligns with best practices in improving employee morale and productivity.

Sustainable Commuting and Health Benefits: Research by Hoehner et al. (2012) showed that employees who walk or cycle to work report higher levels of physical and mental health, which can translate to reduced absenteeism and higher productivity. Coolwood SA’s emphasis on walking and cycling for short commutes aligns with these findings.

Environmental Sustainability

Environmental Benefits: By promoting sustainable commuting options, Scenario Two supports environmental sustainability goals. According to the Team (2019), switching to eco-friendly commuting modes can significantly reduce a company's carbon footprint, contributing to broader environmental objectives.

Comparison to Other Studies:

Reduction in Emissions: A study by the International Energy Agency (2020) found that widespread adoption of public transport and cycling could reduce urban transportation emissions by up to 25%. Coolwood SA’s emphasis on these modes is likely to contribute to similar reductions in their environmental impact.

Corporate Social Responsibility (CSR): A report by McKinsey & Company (2020) highlighted that companies with strong CSR initiatives, including sustainable commuting plans, tend to have better brand reputations and employee engagement. Coolwood SA’s mobility plan supports their CSR goals, enhancing their corporate image and stakeholder relations.

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CONCLUSION

This study effectively addressed the mobility problems experienced by Coolwood SA after its transfer from Maastricht to Hasselt through an intensive analysis and assessment process that included staff profiles, mobility measurements, scenario development, and cost estimates. The study's findings underline the need to design customised and comprehensive mobility strategies considering employees' different demands and preferences. It was feasible to detect distinct employee profiles and their differential appropriateness for utilising public transportation alternatives by adopting a decision tree-based profiling technique. This research emphasises the importance of personnel profiles, mobility metrics, scenario planning, and cost analysis to optimise decision-making and achieve the intended results. The study's findings offer significant insights and suggestions to Coolwood SA and other organisations embarking on similar relocation undertakings, underlining the need for strategic and personalised mobility planning to ensure a smooth transition and long-term economic success.

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