POTENTIAL OF DRONE DELIVERY IN RURAL AREAS

HOW DRONE APPLICATION AND PERCEIVED SAFETY LANDING ZONE OF DRONE INFLUENCE THE PUBLIC ACCEPTANCE

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Abstract

This paper investigates how perceived safe landing location and drone application influence public acceptance of last-mile drone delivery services in rural areas of Province of Drenthe. There has been a high level of interest in drone delivery since its beginning, though public acceptance of drone delivery appears to be limited. This due to safety concern, as an unreliable landing zone can cause drones to fall on private property or injure humans. However, the potential benefits (e.g. instant delivery) of drones can also improve the rural freight transport where rural deliveries are often late due to its remote location and lack of accessibility to the nearest pick up point. In this paper, Knowledge, Attitude and Practice (KAP) model show that public perception varies depending on their understanding of drone, its purpose and their experience. Two different types of landing zone are identified through suitability analysis based on participants' preferred location and their convenience.

Keywords: Public Acceptance, Drones, UAV, Safe Landing Zone, Last-mile Delivery

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Chapter 1: Introduction

1.1 Drone as the New Generation in Last Mile Logistics

Shopping habits in Europe have rapidly changed over the last decade and a large proportion of consumers now prefer to shop online (Morganti, et al., 2014). According to Hong et al., 2018, Unmanned Aerial Vehicles (UAVs) or drone are gaining popularity for the delivery service of small packages in urban areas. However, consumers living in more rural areas have been excluded from the benefits of next-day or even same-day delivery options. Logistics is about efficiency and one of the biggest issue in rural market is that the population density is low, making delivery routes are less efficient (Savills, 2020). This contrast with Hong et al., 2018 – who states that besides all the popularity and advantages of drone have – it is proven that drone has easier access to rural areas rather than in urban areas due to its remoteness and low population density (Leon et al., 2021). In rural Europe, aerial deliveries using drone network could speed up deliveries and enhance the service level which would speed up economic development as well. Therefore, this new technology can provide people in remote areas with access to global trade networks (Heutger & Kückelhaus, n. d.).

Drones are seen as an innovative alternative to conventional delivery methods, such as cars or trucks which are associated with heavy road traffic and environmental pollution. On the other hand, the use of drone in public area is more than just a technological issue (Tan et al., 2020). As with drone, *"Safety is a significant barrier to public acceptance of drone and has repeatedly been identified to be the primary public concern regarding drones"* Chakravarti et al., (2021. P. 28). Research found that increased safety included securing supervision of recreational and commercial drone operation to prevent overlapping traffic in the air (PWC, 2016). Moreover, it is also crucial to ensure safe and reliable safe landing zone to avoid drones falling on the private property or injuring humans (Bektash et al., 2020). In order to increase public acceptance of this new technology, Tan et al. (2020) added that the social and psychological aspects of drone operation in urban environment must be fully understood. For example, public' understanding of drone technology, the potential advantages of drone technology in their daily lives and fears and concerns towards this new technology. Therefore, this study will investigate the issues regarding public acceptance of drones for the delivery of goods in rural areas in the Netherlands.

1.2. Area of case study

Province of Drenthe

The Province of Drenthe is currently promoting Sustainable Urban Freight Transport (SUFT) in their area by getting involved in this project. For example, the Province joined the green deal signed by the region to realize zero-emission city logistics by 2025. On the other hand, there has been an increase of parcel deliveries especially during the COVID-19 pandemic. These conditions require planning to anticipate and adapt to the future by understanding communities better, while utilizing new drone technology the predominantly rural context of Drenthe.

1.3. Research Problem

It is still unclear whether the general public will accept drone use for goods delivery. Based on Aydin (2019), the result showed that drones were not currently well accepted, except for public safety purpose and scientific research application. The safety of drones is increasing with advancement of technology for better airframes and implementation of appropriate rules on airspace, despite which drone accidents still occur. For example, Chakravarti et al. (2021) and Haig (2019) reveal that 33 aviation (i.e. drone and airplane) accidents have been reported in Canada in the first six months of 2019. Moreover, a survey conducted by researchers from Delft University of Technology in the Netherlands discovered that 76 per cent of 5,000 survey respondents from 109 countries were extremely concerned about safety of drone system (Chakravarti et al., 2021; Kyriakidis et al., 2015). The risk to nearby populations cannot be ignored as the operation of drone involves potential hazards, such as vehicle component failures, loss of communication or atmospheric events, among other possible factors (Carney et al., 2019). Therefore, safety is a fundamental issue that needs to be considered as drones become more widely used. In regards to public acceptance, public perception will be a driving factor in the acceptance of drones and in setting safety objectives for safety regulations (Clothier et al., 2019).

1.4. Research Questions

Since safety is one of the main issues that negatively influence public perception towards the use of drone, this research will investigate four types of drone landing zones in different area of Drenthe. By analysing the public perception about these landing zones, this study aims to contribute to safety and drone application as the driving factor in the acceptance of drone in regards to Knowledge, Attitude and Practice (KAP) model by Aydin (2019). Moreover, Tan et al. (2020) also added that perceived potential benefit can be integrated with KAP model to predict public acceptance levels.

Table 1. Research Questions

Main Research Question	Sub-Research Questions
How do perceived drone application and safe landing location influence the public acceptance of drones within the rural areas of Drenthe?	What is the perception of inhabitants of rural area in Drenthe regarding the use of drone as goods delivery service?
	Can the potential benefits of drone delivery services increase the trust of the inhabitants of Drenthe towards drone technology?
	What are the suitable geographical areas to locate safe landing zones for drones in the rural areas in Drenthe?

Chapter 2: Theoretical Chapter

2.1 Defining Sustainable Urban Freight Transport (SUFT)

There is lack of previous research studies on the concept of SUFT in the scope of rural areas, however, it is still necessary to understand general concept of SUFT to grasp an the idea behind it. Behrends et al. (2008) and Gonzales-Feliu (2018) describe the concept of Urban Freight Transport (UFT) as a freight transport that flows within urban areas which can lead into negative externalities on the urban environment. Imagining that the number of UFT (i.e. trucks and vans) that deliver the package to consumer increased every year would obviously generate more pollution in the urban area. According to Koiwanit (2018), even though there is less traffic congestion in rural areas, road infrastructure causes difficulties for retailers when completing each delivery. The carbon footprint calculation of the U.S. online shopping system using various delivery options, including cars, buses, parcels carriers, road trucks and airplanes, have been evaluated along with electricity gas, natural gas consumption and packaging material**.** The impact of negative externalities of UFT needs sustainable improvement to mitigate the negative impacts, such as, by improving the quality of urban environment, economic performance as well as social effects (Behrend et al., 2008; Cullinane, 2014). In conclusion, sustainable freight transport is an essential component in city life (Behrend et al., 2008). However, since this study will be conducted in rural context, therefore this paper will use the term of Sustainable Rural Freight Transport (SRFT) instead of SUFT.

2.2 Drone as a Service (DaaS) for goods delivery

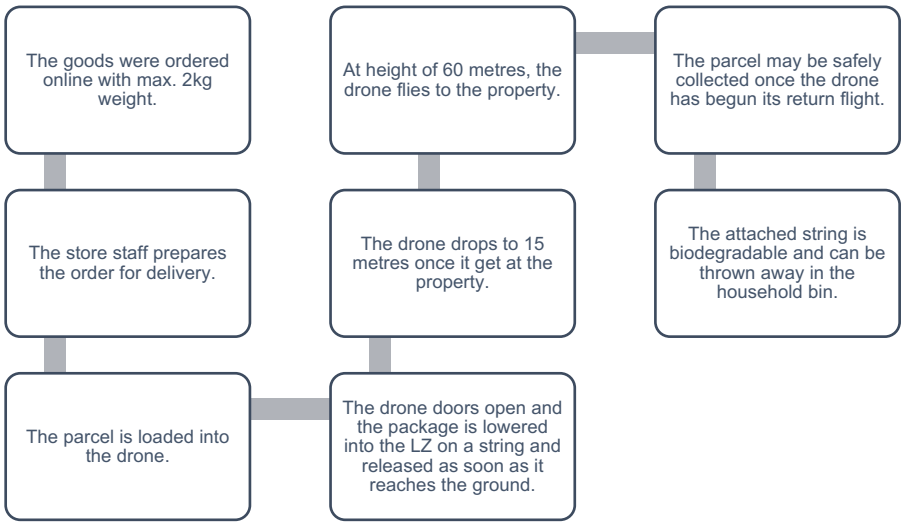
A recent invention that has the potential to improve both economic and environmental aspects in the "last mile" delivery of products to consumers (B2C) – is Unmanned Aerial Vehicles (UAV) or so-called drone. Their application has benefits in different areas, including agriculture, land-use surveying, humanitarian work, healthcare logistics, weather research and delivery services (Ghelichi et al., 2021; Nguyen, 2019; Aydin, 2019). Although drones are mainly for smaller packages they can result in energy savings in the long run (Hong et al., 2018; Chiang et al., 2019). Additionally, drones can deliver packages via an optimal route from origin to destination where fixed costs can be minimized by reducing the number of vehicles required and the overall delivery time through accurate predicitions (Chiang et al., 2019; Jaramillo et al., 2019; Hong et al., 2018).

Figure 1. DHL "paketcopter" (Heutger & Kückelhaus, n. d.).

Most literature focuses on the cost-efficiency of using drones as well as the reduction of traffic congestion whereas Yoo et al. (2018) and Park et al. (2018) more focuses more on the environmental contributions of drones. Amazon has made a comparison study of carbon dioxide emissions produced by drone and truck deliveries, considering energy requirements, number of deliveries stops and seize of service zone (Yoo et al., 2018). Therefore, drones can enormously help to achieve sustainability goals by reducing energy use in transport, distribution and consequently can minimize both fuel costs as well as carbon emissions. Unfortunately, existing drone delivery has a limited range (i.e. distance and flight time) and capacity (i.e. weight and size), it is frequently unable to deliver all packages in a single trip. Most likely, the drone will be paired with a vans or trucks where drones will be responsible for the final delivery to customers in peripheral areas while vans will be responsible for delivering goods from distribution warehouses to selected drone stations (Wang et al., 2021). Although the drone only serves a subset of customer, this mode of package delivery still has the potential to substantially reduce the negative environmental effects of deliveries (Chiang et al. 2019).

Amazon and the world's largest logistics company DPDHL (**Figure 1**) are the two primary companies that are testing drone deliveries. Electric and internal-combustion engines are the most common types of engines utilized in non-military drones currently. These types of engine are both environmentally friendly and produce low levels of noise **(**Heutger & Kückelhaus, n. d.). Another example of recent testing has been undertaken by Irish startup Manna which has tested drone delivery services on the outskirts of Dublin and completed up to 100 deliveries per day (Albrecht, 2021). They have been delivering orders by drone from Tesco, local coffee and bookshops, takeaways via Just Eat.

Figure 2. Schematic of drone as a service for goods delivery within same-day or instant delivery process (Williams, 2021).



A schematic by Williams (2021) on **Figure 2** illustrates the workflow of DaaS for goods delivery which starts from the customer ordering the goods and subsequently being delivered to their home. Drones could satisfy customers' expectations in terms of speed, flexibility, security and cost (Aydin, 2019) however, Clothier et al. (2019) added that it depends on the purpose of the drone itself. For example, citizens have concerns about drones being used for potential military uses and criminal misuses. They are also aware of drone malfunctions and crashes in populated areas, and invasions of privacy caused by flights over their private property (Aydin, 2019; Leon et al, 2021).

2.3 Public Acceptance of DaaS

The public acceptance is critical for the widespread use of drones for goods delivery. In regards to knowing the benefits and risks of drone delivery, Aydin (2019) and Clothier et al. (2019) stated that customer's perspectives about drone delivery plays important role on B2C service. The quantitative study of public acceptance by Aydin (2019) was conducted by using the Knowledge, Attitude and Practice (KAP) model while utilizing statistical data to reduce bias in the survey. Many researchers have used this framework to investigate the public's reaction to existing or emerging technologies in order to better integrate these technologies into society (Tan et al, 2020). In this study, the KAP model is used as a guiding framework to integrate include various factors that could be potentially associated with public acceptance towards drones.

- **Knowledge** refers to participants' understanding towards drones (Reddy and DeLaurentis, 2016). It is impossible to develop effective strategies to manage the

drone revolution without knowing how much the general public knows about drones (Aydin, 2019). For example, people who are familiar with drone technology will tend to accept this technology while people who do not, will tend to be against the use of drones. Therefore, this study will focus on participants's familiarity with drones.

- **Attitude** refers to participants' feelings toward drone as well as any preconceived notions they may have about it (Reddy and DeLaurentis, 2016). The purpose is to investigate if there are significant differences between support for parcel delivery, medical purposes and military uses. In the Tan et al. (2020) article, it does appear that public acceptance of drones is greatly dependent on what the drone is being used for and by whom. The results of this study reflect on how public acceptance towards drone varies based on who the user is and what the drone is being used for.
- **Practice** refers to the actions participants take to demonstrate their knowledge and attitude (Reddy and DeLaurentis, 2016). Experience with operating drones influences public acceptance. Tan et al. (2020) stated that people with drone experience were reported to have more concerns about drone operations than lay people with less experience with drones. For example, experienced drone operators have reported drone accidents and thus, they might have more concern about safety concerns. Therefore, this study includes a measure of the public level of practice and the reasoning for the negative perceptions of drones.

Tan et al. (2020) study contributes to the literature on understanding public acceptance, the study introduces the factors that influences the perceived potential benefits for participants (e.g. help to reduce CO2 and same-day delivery) and their level of trust towards drones for goods delivery and how they affect the publics acceptance towards drones. Klauser and Pedrozo (2017) findings show that older groups in Switzerland are more resistant to drone. Furthermore, females were found to be more afraid of autonomous robots and artificial intelligence. As a result, demographic factors such as age, gender, educational background are expected to also influence public acceptance of drones and will therefore be measured in this study.

2.4 Safety Landing Zone (LZ)

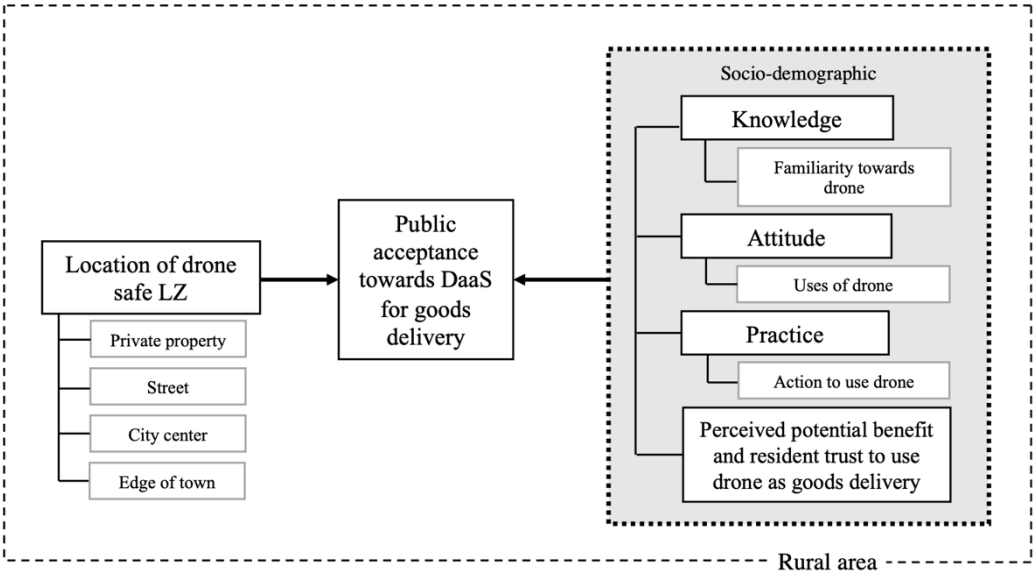
Drones have the potential to be employed in a variety of urban applications. Allowing drones to fly above highly inhabited areas, on the other hand, creates safety concerns (Guerin et al., 2021; PWC, 2016). Moreover, drones must land securely in an area that minimizes robot damage while also avoiding humans. Nonetheless, there are no specific requirements, guidance or regulations regarding LZ selection for drone operators (Sanders, 2020). Therefore, in order to ensure a safe operations, it is necessary to provide a reliable LZ

(Loureiro et al., 2020). The reliability of safe LZ's depends on two main factors, the distance between aircraft and the LZ, as well as the ground conditions. This research will focus on the ground conditions to determine optimal LZ. The conditions that must be considered are: the roughness of the area, the size of the spot and presence of obstacles (Loureiro et al., 2020). Based on Loureiro et al. (2020), any unobstructed and vast area is thought to be suitable for delivery drone LZ, thus this paper provides four alternatives for LZ: a) private property; b) street; c) centre of the village; d) edge of town. Landing guidance demonstrates that a deliberate deployment can increase overall operational reliability, which has a significant impact on drone safety (Bektash et al, 2020).

2.5 Proposed Research Framework

This paper focuses the use of drones in future sustainable logistics by identifying the influence of public acceptance towards safe landing zones using the KAP (Knowledge, Attitude, Practice) model based on socio-demographics of the citizens of Drenthe.

Figure 3. Proposed framework for understanding factors that influence public acceptance towards DaaS for goods. delivery.



2.6 Hypotheses

This paper aims to examine the public acceptance towards drones in three rural villages of Drenthe. The results will be determined usign the Knowledge, Attitude and Practice (KAP) model, resident's perceived potential benefit and trust towards using drones as goods delivery service based on socio-demographic status, as well as safe landing locations choices. In order to answer the main research question of this study, there are two main hypotheses:

H1: "Perceived safety of landing zones can increase public acceptance of the use of drones".

H2: “Knowledge, Attitude, Practice (KAP) model influences the public acceptance of drone for goods delivery”

Chapter 3: Methodology Design

This paper will perform a suitable analysis of drone safe landing zones for goods delivery and the public acceptance of inhabitants of three rural areas within Province of Drenthe towards drones. The study area will be explained, followed by the GIS analysis which required datasets that are defined from an interviews. Furthermore, the questionnaire will be structured by using empirical quantitative data.

3.1 The Case Study Area

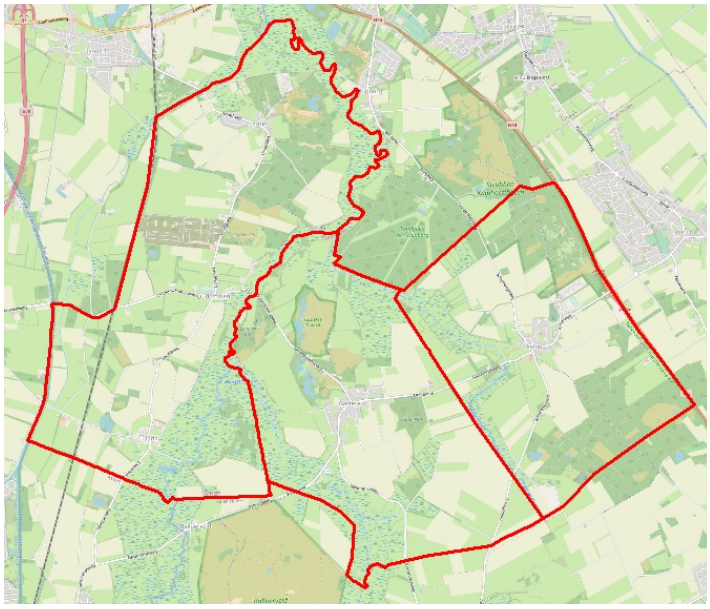


Figure 4. Overview of Zeegse (left), Gasteren (middle) and Anlo (left).

Figure 5. Focus on residential area in Anloo

Figure 6. Focus on residential area in Zeegse

Figure 7. Focus on residential area in Gasteren

Based on the literature, it is known that using drones for goods delivery has been particularly suitable in rural areas with lower population density and accessibility by land than urban area (Park et al., 2018). However, based on OECD data, there are no rural areas in the Netherlands. Yet, a survey was conducted by researchers from the University of Groningen showing that rural areas exist in the Netherlands and are mostly located in the North of the country (Haartsen, et. al., 2002). In regards to that, the Author will clearly define criteria of rural area for this specific research as follow:

- Total population is lower than 500,
- Population density less than 550 per square km,
- Primary industry is agriculture and most people live or work on farms,
- Limited choice of shopping, medical services, other services,
- Low public transport accessibility, especially in regards to nearest major urban concentration.

As mentioned above, this research only focuses on three potential location (**Figure 4**) of rural areas in the Province of Drenthe for comparison purpose based on remoteness and accessibility. Additionally, Zeegse (**Figure 6**), Gasteren (**Figure 7**) and Anloo (**Figure 5**) have been chosen because they successfully met the criteria that has been aforementioned.

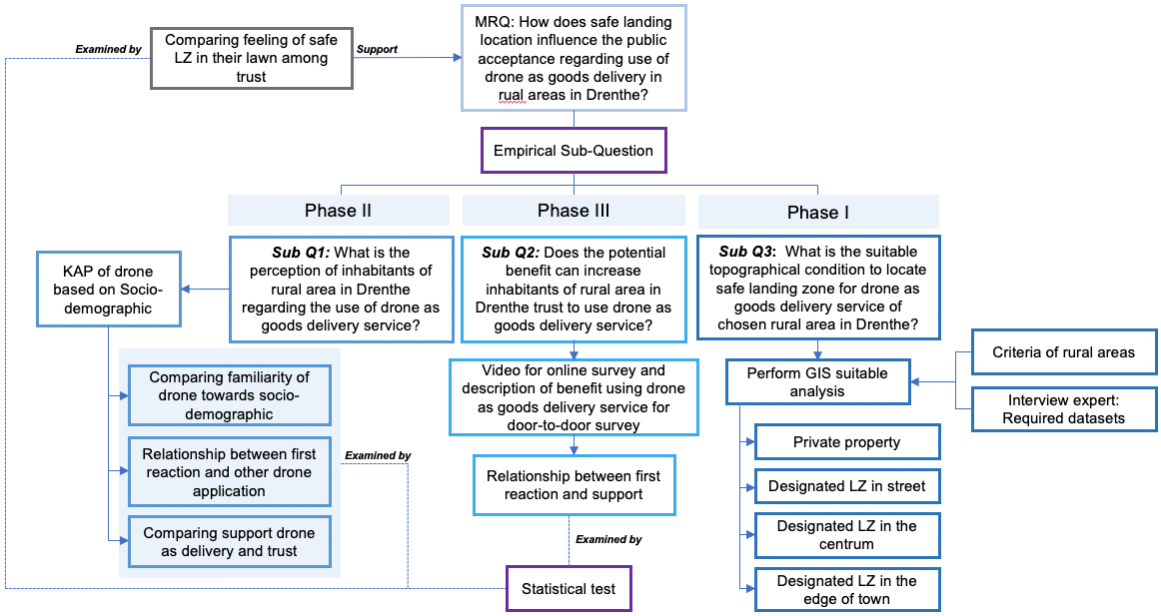
Table 2. Demographic characteristics of selected rural areas in Province of Drenthe (Kadastrale Kaart Buurt Zeegse; Kadastrale Kaart Buurt Gasteren; Kadastrale Kaart Buurt Anloo, n.d.).

	Zeegse	Gasteren	Anloo
Total Population (2020)	215	400	320
Population Density (per square km)	303	44	533
Total Household (2018)	95	180	140
Age Structure	11% aged below 15 9% aged 15 to 25 12% aged 25 to 45 40% aged 45 to 65 28% aged over 65	7% aged below 15 11% aged 15 to 25 12% aged 25 to 45 41% aged 45 to 65 30% aged over 65	12% aged below 15 9% aged 15 to 25 13% aged 25 to 45 39% aged 45 to 65 27% aged over 65

3.2 Schematic Overview of the Research

This research design is visualized as discussed in Methodology Design (see Appendix 1). It is divided into three phases to maintain organizational structure. The research begins with finding suitable LZ for drones for goods delivery (Phase I), followed by defining public acceptance regarding the use of drones (Phase II) and perceived benefits for the residents in each village – in relation to support and trust of drone use for goods delivery (Phase III).

Figure 8. Summary of research design based on Methodology Approach (Appendix 1)



3.3 GIS Data Collection and Analysis

Data Requirement of Drone Safe LZ

DaaS for goods delivery have not operated yet in the Netherlands yet. It is still in the of trial and error stage therefore, potential safe LZ sites are hypothetical, as current drone regulations and technology make widespread delivery by drone a future based scenario. The way drones are used will have impact on how they affect people's living environment. There is no formal training based on actual real-world experience to prepare for landing zone site selection for drone operation, despite the fact that it is one of the most crucial factors in the successful application of drone technology (Sanders, C., 2020). Thus, a GIS-based approach is used to determine suitable LZ for delivery drones. The criteria of datasets that were required for GIS analysis were identified through an expert interviews.

Table 3. GIS requirement table to support suitable analysis of safe LZ.

Requirement	GIS criteria	Source	Spatial/attribute data	Primary/secondary
No-fly zone	N/A	N/A	N/A	N/A
Road (Including interstate and highway)	Drone are not permitted to fly and land over roads where traffic counts are high.	https://rug.maps.arcgis.com/home/item.html?id=8616a37c026f4dcdb81761ee9ca85800	Spatial	Secondary
Railroad	Hundreds of kilometers of	https://rug.maps.arcgis.com/h	Spatial	Secondary

	railroad are covered with this data layer.	ome/item.html?id=7b96d2c58340464aa3fe45d1c6ee298e		
Bus stop	Data layer covering bus stops to prevent accessibility on people.	https://rug.maps.arcgis.com/home/item.html?id=ceb12ab459124f009d1b257d6458cbb3	Spatial and attribute	Secondary
Station	N/A	N/A	N/A	N/A
Wind farm	Data layer representing locations of wind turbines.	https://rug.maps.arcgis.com/home/item.html?id=113ab61ef0344c14a4911cb76339c47e	Spatial	Secondary
Clearance area	Required area for drone to land with radius at least 5m.	N/A	Spatial	Secondary
Land use	Data layer representing the land use to avoid crowd in commercial area for example.	https://geodienst.xyz/data/municipalities.php	Spatial and attribute	Secondary
Rooftop (if applicable)	Show areas where drone can be landed on rooftop of private property.	https://docs.3dbag.nl/en/schema/concepts/	Spatial	Secondary

An ArcGIS flowchart (See Appendix 4) has been implemented to identify the suitable safe LZ for DaaS for goods delivery. However, it is impossible to use all the required data (Table 3) because these three villages are covered by Natura2000, protected natural areas within the jurisdiction of the European Union (Natura2000, 2008). Another reason is DaaS for goods delivery is not yet feasible in the Netherlands, therefore, no such fly zones have been identified for this application.

The first process within this analysis will determine non-suitable LZ for drone goods delivery with buffering components required within specific distances or a given radius (see Appendix 4). Afterwards, each of the outputs will merge together to determine restricted areas for drones to land. Second, is creating the clearance area within a designated radius based on assumption of type of drone which used for this research. After non-suitable LZ are selected in ArcGIS, the output is being checked in Google Earth for further analysis and checks whether there is a specific area that is not covered by buffer areas or there is possibility for drones to land within a specific radius. Therefore, when determining a suitable location, the buffered area would be reduced from 25 to 10m because there is still a greater chance for a drone to land at the specific location.

Drone Specification for Analytic Purpose

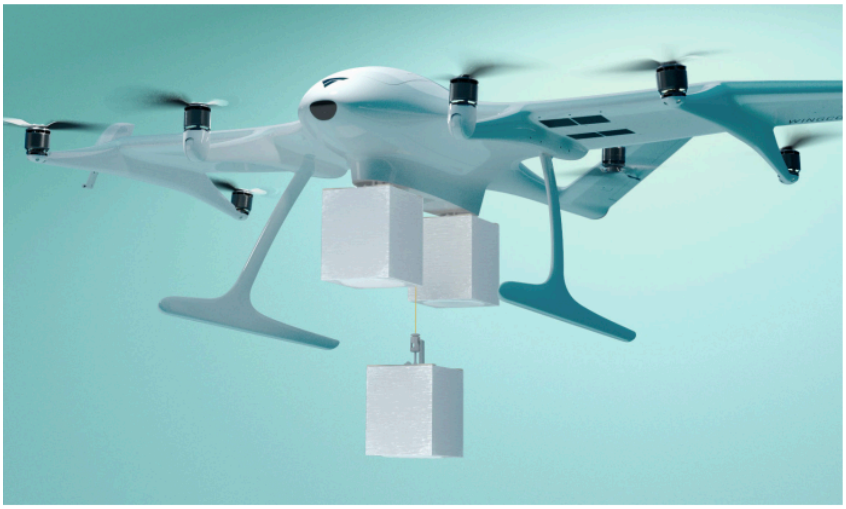


Figure 9. Image of Wingcopter 198 (Wingcopter, n.d.)

As a result of the interview mentioned above, it is necessary to form an assumption of the type of drone in order to define suitable safe LZ. Wingcopter 198 (Figure 9) is the new generation of 178 series which UPS previously used for drone goods deliveries. It can deliver up to three separate packages to multiple locations with a total weight of 5kg in a single flight. Moreover, the entire process is automated, lowering delivery costs and increasing route efficiency (Wingcopter, n.d.).

Table 4. Overview of Wingcopter 198's specification.

Frame Size (cm)	65x198x152 (H x W x L) 1.98m x 1.52m = 3,0096 sqm
UAV Weight (kg)	10kg empty 20kg with batteries 25kg max. take-off weight
Max. flight time	15 min
Max. altitude	3000m AMSL
Range and max payload	110km = without package 95km = 1kg 90km = 2kg 85km = 3kg 80km = 4kg 75km = 5kg
Max. Payload (kg)	5
Loading	On ground
Delivery	On ground or slow drop

3.4 Questionnaire Design

The quantitative method approach is utilized in order to explain public perception towards the use of drones in Drenthe by distributing a survey in Dutch. The survey was made using online software called Qualtrics. The author went to the potential location to arrange and conduct the survey on location. The survey questions were initially made in English by the author which then were translated to Dutch which was more suitable for the local population. A combination of multiple-choice and multiple-answer has been used. Following Punch (2014), the questionnaire seeks factual information – three parts have formed the basis for the survey design, an introduction section, public acceptance based on the KAP model and the last section is safe landing locations with information about four potential locations for safe landing zones.

A table in Appendix 1 presents an overview of the questions per section, followed by measurement levels, answer options and question aims for each part of the survey. Before distribution of the survey to the neighborhoods in potential locations in Drenthe, the author conducted a survey pre-test with three different people outside of the study. Pre-testing was essential to determine whether or not the respondents understand the questions as well as to increase the validity and reliability of testimonial survey evidence (Ignet, 2017). As a result,

improvements in questionnaire design were made to correct grammatical errors and eliminate confusing answer options. More importantly, the design was changed to make the questionnaire simpler and more easily understood by the respondents.

3.5 Recruiting Participants

Via Post Box Invites

Since the villages consist of approximately 40 houses, 125 flyers have been distributed throughout each village to invite participants to fill in the survey. These flyers were put in people's post boxes. Additionally, the flyer also includes a short introduction about the research, a QR code and link to the survey's website (See Appendix 5).

Via Online Platforms

By reaching out people who live in a chosen neighborhood via Facebook and the village's website to spread the survey via WhatsApp Group and thus encourage members to complete it. This method worked successfully for people who live in Gasteren and Anloo.

Door-to-door Survey

Since the response rate was still low, especially in Zeegse, a door-to-door survey was conducted by knocking on the doors of homes to recruit more respondents. It is very efficient and the fastest way to gain respondents. Additionally, it enables seniors who are unable to scan the link from QR code to fill in the physical survey.

3.6 Selecting Statistical Test

The data has been visualized by using descriptive statistics, including bar chart to show difference results between each village. The Kruskal-Wallis test (KW-test), Spearman's Rho and Mann-Whitney test which are non-parametric have been used in this research due to low sample size. KW-test has been utilized to determine if there are significant differences between two or more of groups of nominal variables on ordinal variables (See Appendix 3). The Spearman's Rho has been used to examine the correlation between two variables, and whether the result is positive or negative as well as the strength of this relationship. Additionally, the Mann-Whitney test investigates the difference in the dependent variables for two independent groups, such as gender (i.e. men and women). In conclusion, every variable that needs to be tested with a statistical test will be followed with null hypothesis (See Table 5) to determine the possible conclusion that is best supported by the sample data.

Figure 10. Statistical analysis visualized in a flowchart.

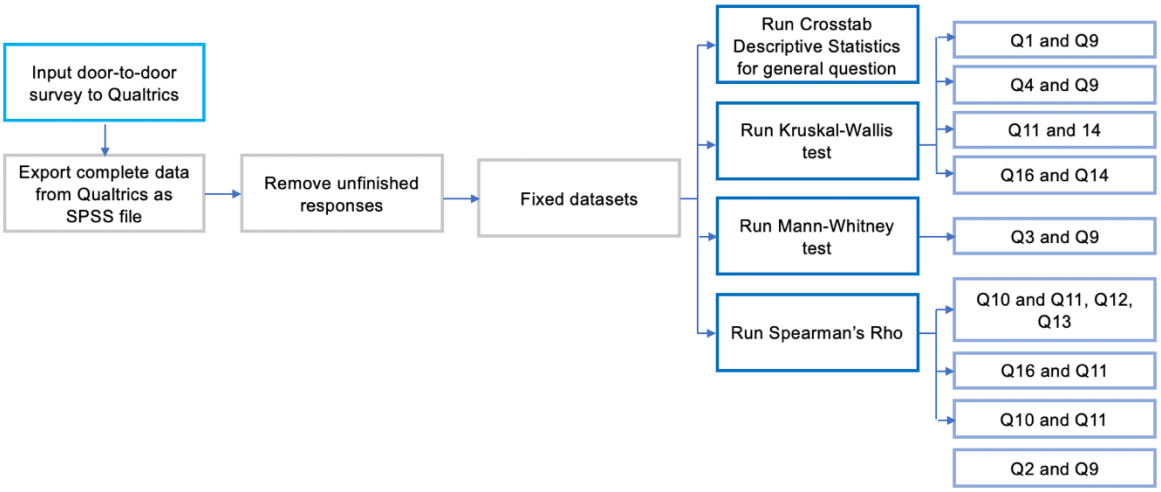


Table 5. List of Hypothesis for each statistical test

Variables	Null Hypothesis
Q1 and Q9	In the population, there are no difference between familiarity among three location
Q4 and Q9	In the population, there are no difference between familiarity and latest education level.
Q11 and Q14	In the population, there are no difference between trust and support towards drone as goods delivery.
Q16 and Q14	In the population, there are no difference between trust and feeling of package being delivered in front of your lawn.
Q3 and Q9	In the population, the mean rank for both genders are an equal
Q2 and Q9	In the population, there is no relationship between age and familiarity towards drone.
Q10 and Q11	There is no relationship between first reaction and support towards drone as service for goods delivery in the population.
Q10 and Q11, Q12, Q13	In the population, there is no relationship between first reaction and support towards drone as goods delivery, first-aid and military purpose.
Q11 and Q16	In the population, there is no relationship between support towards drone as goods delivery and feeling of package being delivered in front of your lawn.

3.7 Ethical Consideration

In this research the author will be using a combination of GIS analysis and survey. In order to make sure that this research is ethical – the author has used the following the guidelines set by the University of Groningen outlined by their website. These guidelines are based on the national Dutch code of conduct for research integrity (Netherlands Code of Conduct for Research Integrity, 2018). One of the safeguards is an information sheet or page to be provided for respondents to the study outlining what the research will be about and how the data of the respondents can be used. The author ensured to approach the respondents professionally, and within reason, make sure that they were fully informed about the research's purpose and context, as well as confidentiality and anonymity (Punch, 2014). Once the respondents look through the information page, the respondents will be asked to sign or tick an agreement form making sure they are aware of the nature of the research. Furthermore, the survey remains anonymous, the participants will not be asked to fill out their name. However, in order to win the gift card, the respondent will be obligated to submit the email address. Thus, the result will not be anonymous anymore when the participant ticks the box of agreement. Nevertheless, for respondent that would like to increase their chance to win the gift card, the author will delete the answer that has similar email addresses to avoid any data fraud.

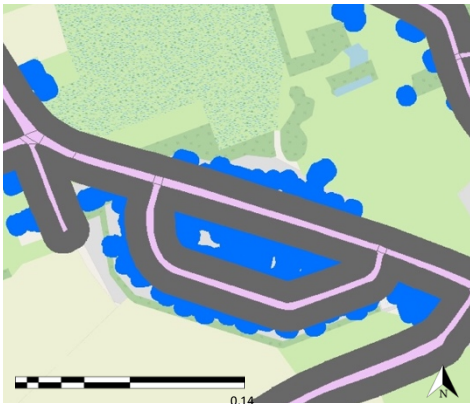
In order to avoid inaccurate results, the survey questions shall be written by avoiding wording that may offend, distress or humiliate respondents. Moreover, the result will be computed into statistical tests (i.e. SPSS) to validate the findings and show significance in the result (Fisher, 2020). Last but not least, all the input from desk research will be referenced by the author as well as other outside materials that were used to construct this research paper.

Chapter 4: Empirical Findings

Phase I: Suitable Location for Safe Landing Zone

This section will explain the process of finding suitable LZ for DaaS for goods delivery. The analysis started with disregarding wind turbines, station and railroad datasets as data requirements because those components are not found within these areas. Besides, only the interstate road, building with any kind of land use and bus stops are used in this analysis. However, it is not clearly seen where the bus stop is – due to an overlap layer on top of it. The buffer was created randomly to only predict where non-suitable LZs are. It was purposely set to a larger size to covered any obstacles (i.e. trees) in the surrounding area. The results showed (**Figure 11** and **Figure 12**) that there are almost no locations that can be used for drones to land, especially at the front door of each houses or even in designated streets. The only option left is either land in the center of the neighborhood or on the edge of the town. Therefore, the next step is to cross-reference on the Google Earth by overlaying the buffered map on top of their satellite map to identify whether there is still an empty land that might be utilized for drones to land within a specific radius of potential clients door.

Figure 11. Not suitable safe LZ for drone to land in Gasteren (left) and Anloo (right) with buffer 25m for road and bus stop and every building for 10m.



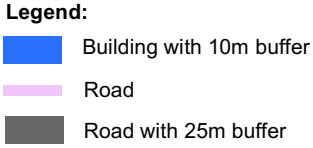


Figure 12. Not suitable safe LZ for drone to land in Zeegse with buffer 25m for road and bus stop and every building for 10m.

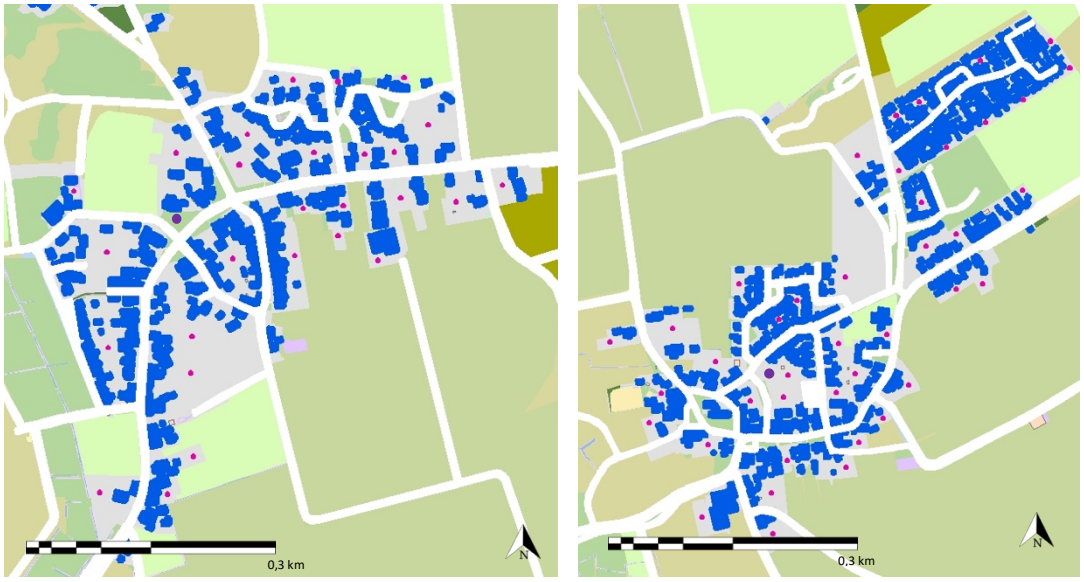


Figure 13. Suitable LZ for drone to land with various type of LZ in Gasteren (left) and Anloo (right) with buffer 5m for road and bus stop and every building for 5m.

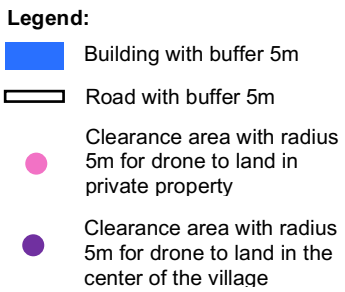


Figure 14. Suitable LZ for drone to land with various type of LZ in Zeegse with buffer 5m for road and bus stop and every building for 5m.

An overlay analysis from Google Earth showed that there was a potential leftover land that would become available by reducing buffer radius. This suitable LZ has been made together with the results of the questionnaire. **Figure 13** and **Figure 14** show suitable LZ in various type of LZ. A radius of 5m has been created as a clearance area for drones to land near private properties. This type of LZ has been designated and can be reached within walking distance since the result of the survey (**Figure 15**) also mentioned that 90 per cent of the respondents would prefer to walk to pick up their package. Moreover, designated LZ in the center of the village would be the other option for drones to land, this LZ option is suggested for people who chose to bike or use car to pick up their package. Additionally, the suitability analysis results suggests not to have LZ in the street due to safety considerations. Having LZ at the edge of the town is not recommended due to land use zoning, which typically reserves

this land for farm or agriculture purposes. As a consequence, it contradicts with four alternative LZ proposal which are already suggested in this study.

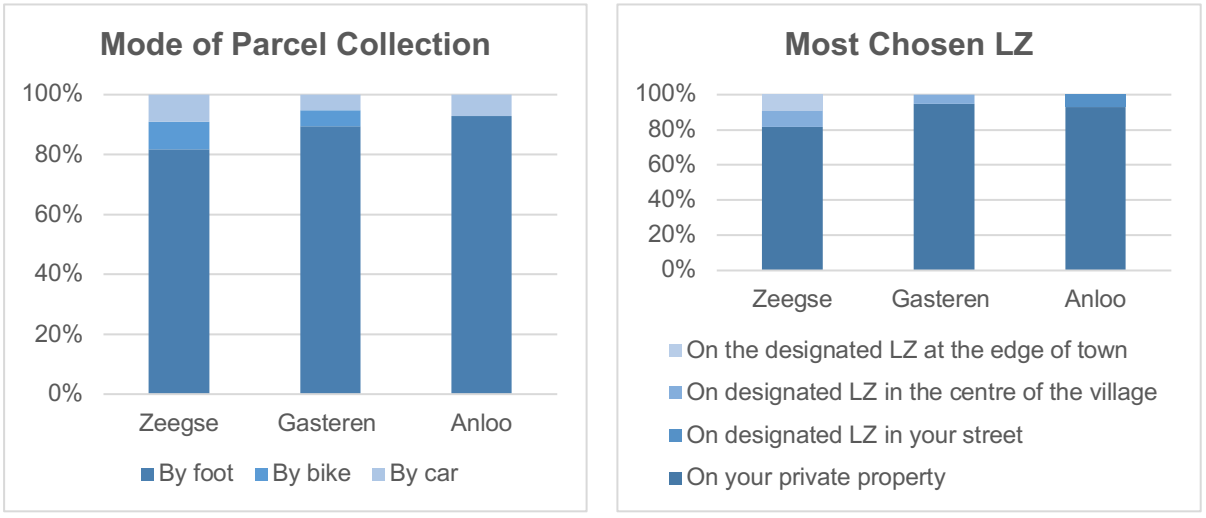
Statistical Test Result

General Overview of Respondents

44 valid responses were recorded which include 11 respondents from Zeegse, 19 respondents from Gasteren and 14 respondents from Anloo. The respondents represent at least 10 per cent of the total household in each neighborhood. However, there were 3 unfinished online surveys which would not have counted as valid responses and therefore have been removed from the system.

Perceived Safe LZ

Figure 15. Preference of parcel collection mode (left) and most preferred LZ for drone to land (right).



In regards to the main research question, statistical tests were conducted to find a correlation between “How would you feel about having a package delivered anywhere on your front lawn?” (Q16) and “Would you support drone application for parcel delivery purposes?” (Q11). The result is highly significant ($p = .001$) and therefore, the null hypothesis can be rejected. This means that people who feel positive about package delivered in front of their lawn tend to also support drone as delivery of goods. Other variables (i.e. Q16 and Q14) have been tested to ensure the outcome of public acceptance towards perceived safe LZ. As a result, there is a significant difference between feelings about packages being delivered on their front lawn and on trust of drones to deliver the package. It can be concluded that in the population, people who feel positive about their package being delivered on their front lawn are in favor of trusting drones to deliver the packages.

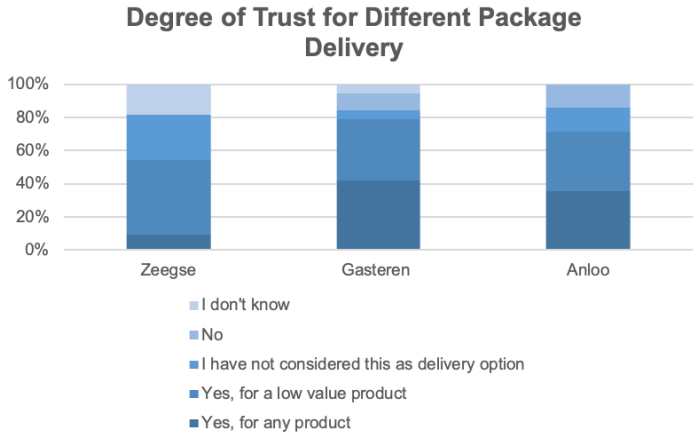
In the questionnaire, respondents were asked their preferred landing zone for package delivery by drones (**Figure 15**). In general, approximately 90 per cent of respondents among three villages would prefer the drone to land on their private property. Only 2 per cent of respondents chose either on designated LZ in their street, center of the village or edge of the town respectively. Mode of preferred parcel collection was asked right after preferred LZ to see customer preference for collecting their package. Results show in **Figure 15** that almost all respondents prefer to collect by foot rather than using bike or car.

Phase II: The influence of Knowledge, Attitude, Practice (KAP) model towards Public Acceptance of DaaS for goods delivery

This section aims to answer the first sub-question *about 'What is the perception of inhabitants of rural areas in Drenthe regarding the use of drones as a goods delivery service?'*. According to Aydin (2019), socio-demographics (i.e. age, gender and education) influence public perception about using drones for goods delivery. Findings reveal that correlation between age (Q2) and familiarity towards drones (Q9) is not significant, therefore it cannot be determined whether there is strong or weak relationship between those variables. In addition, in regards to gender, a significant result was shown between gender (Q3) and familiarity with drones. It presents that men have a highert rank rather than women – which means that men are more likely to be familiar with drones than women. Next, the results of the correlation test between education (Q4) and familiarity with drones was not significant, thus education is not the factor that influences public familiarity with drones.

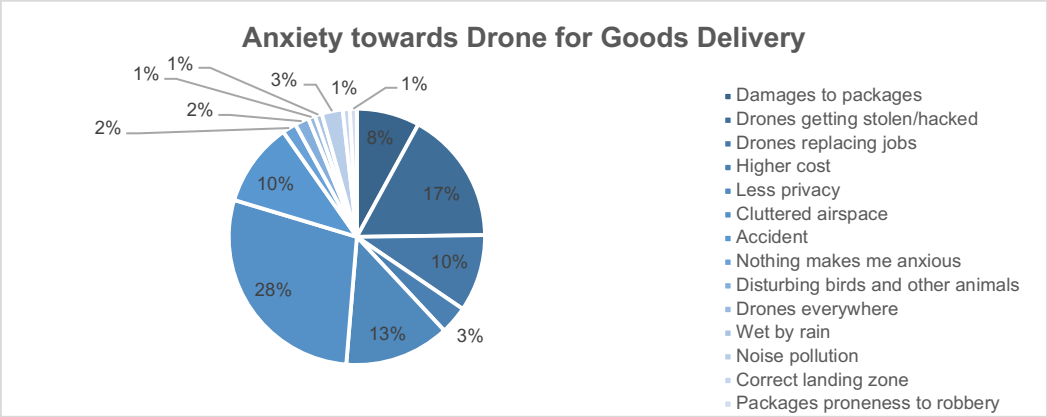
Attitude factor result (Appendix 3) shows that there is strong relationship between people's first reaction (Q10) and their support reaction towards drones for goods delivery (Q11). A positive result from this statistical test also indicates that people who have a positive reaction towards drones tend to support drones for goods delivery purposes. However, interestingly, the result continuously shows that people will support the use of drones for goods delivery (Q11) as well as first-aid purposes (Q12). Yet, negative and not significant results can be found for the use of drones for military purposes (Q13) because respondents are mainly disagree about that application.

Figure 16. Trust of using drone for goods delivery and its preference type of goods.



According to the Practice factor of Aydin (2019) where this test was taken to demonstrate participants' knowledge and their attitude towards DaaS for goods delivery. The Kruskal-Wallis test has been used to determine the correlation between trust (Q14) as the Practice factor and degree of agreement of using drones for goods delivery (Q11) as Attitude factor. The result is highly significant (p = .006) which means that respondents who agree with the use of drones for goods delivery will also trust drones to deliver their package. **Figure 16** also shows that most of the respondents trust the use of drones for any kind of product and low value products.

Figure 17. Anxiety reason towards drone for parcel delivery



In addition to the Practice factor, a subsequent question asked respondents about anxiety towards DaaS as goods delivery . In contrast to Aydin (2019) findings that people were mostly concerned about privacy because drones are flying over their property. Suprisingly, the survey results (**Figure 17**) below show that 28 per cent of respondents are more concerned about cluttered airspace and drones are getting stolen or hacked (17%) than less privacy (13%). This question was an open question, thus respondents could actually write what they are concerned about. Various answers occurs such as, animal welfare, rain damage, noise

pollution, correct landing zones and packages susceptability to robbery. “Nothing makes me anxious” was also an answer option, however, nobody answered using that option.

Phase III: Consumers’ Perceived Potential Benefits of DaaS for Goods Delivery

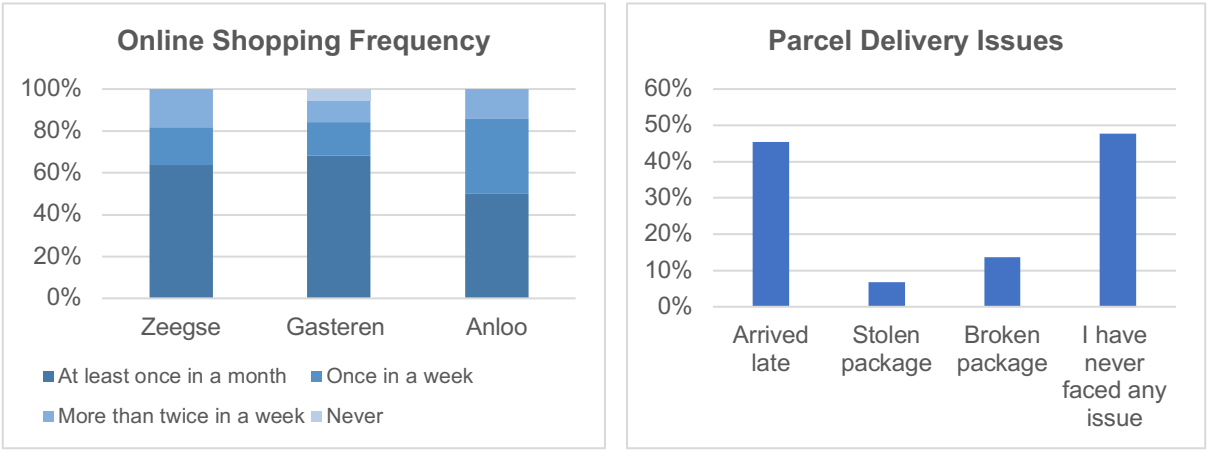


Figure 18. Percentage of online shopping frequency (left) and parcel delivery issues (right).

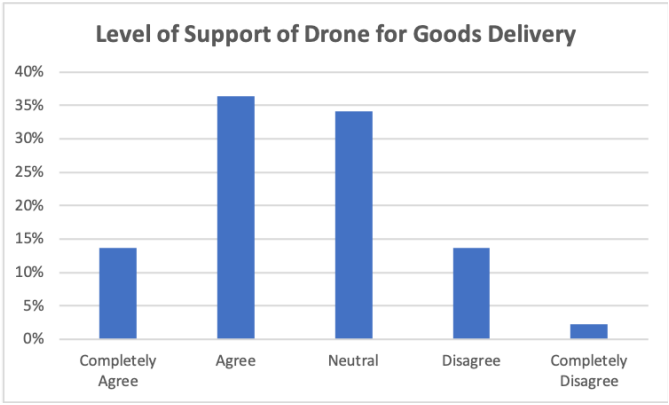


Figure 19. Percentage of level of support after knowing perceived potential benefit of using drone for parcel delivery.

Descriptive statistics is used to show the online shopping frequency as well as parcel delivery issues. Based on **Figure 18 (left),** it appears that respondents often do online shopping at least once in a month. Furthermore, **Figure 18 (right)** presents that more than half of the sample population has reported a shipping delay, followed by participants with have had no shipping problems (48%), broken package for 14 per cent and stolen package for 7 per cent. Besides, in the Questionnaire Design (Appendix 2), respondents were given a short movie, for those who conducted the survey online and a short description those who did the door-to-door survey. Both short movie and description contains the potential benefits of using drones for goods delivery. Subsequently, respondents were asked about support for the use of drones for parcel delivery purposes (Q11) with knowing the potential benefits that they will receive by using drones for goods delivery as is shown in **Figure 19**. In summary, from five levels of the

likert scale (**Figure 19**), people have generally chosen “Agree” (36%) instead of “Completely Agree” (14%), followed with “Neutral” (34%), “Disagree” (14%) and “Completely Disagree” (2%).

Chapter 5: Conclusion

Generally, the use of DaaS for delivery of goods mostly gained positive support from the respondents. The study explored the public acceptance for goods delivery by drone in rural villages in the Dutch province of Drenthe using the Knowledge, Attitude and Practice (KAP) model based on the socio-demographic background. Yet, the findings show that age and education do not influences the KAP model of public acceptance. The significant result has only shown with gender – that men have higher tendency to be more familiar with drones than women. The acceptance of drones varies significantly depending on the contexts of use – parcel delivery and medical purposes had the support of the participants while military uses had a negatively significant result. It also appears that drones will be used for parcel delivery in the near future – supported by nearly half of the respondents experiencing shipping delay. This research also performed suitability analysis for safe LZ where it can be concluded that the most suitable LZ and favorable LZs are actually on the front lawn. It is not possible for drones to land in front of every houses' land but, the analysis ensures that drones will be landed within walking distance. Although drone development is still at an early stage, one of the findings show that the respondents do notice the disturbances that drone cause. Some respondents already expressed annoyance or fear about their affect on animals, especially farmers. Therefore, this should be considered as animal welfare will be one of important barriers to drone implementation in rural areas supported by this research conducted near farm land. Nevertheless, the technology of drones is getting accepted by the public with safety conditions, it is therefore the drone regulations that should be clear to achieve certain results.

Discussion and Recommendation

Research Discussion

This study has highlighted a number of factors that might both boost and inhibit drone implementation. As it has been analysed in Phase I, DaaS for goods delivery is not feasible to land at the edge of the village. The results show that land use zones in the three surrounding neighborhoods are mostly classified as agriculture and farm use. This measure is taken based on the consideration from the respondents who have a particular concern towards livestock. Furthermore, street were chosen as the last option for LZ sites. Dutch road construction is not generally narrow, therefore there is no possibility for drones to land making it not a recommended LZ. Despite the issues that arose during the analysis, the most suitable LZ has been within walking distance.

The public should be made aware of the applications of drones for goods delivery, their benefits to society and given that nearly more than half of respondents have experienced shipping delays, they are likely to agree that they have a positive perception of the potential benefits that drones can provide. Noise pollution is an additional risk that was not included in the survey (Q15), but was mentioned by the respondent. Drone designers are already addresing the noise issue by designing low-noise propellers and motors. Since this study was limited to the Netherlands, conditions in other countries may result in different findings. Convenience has more priority over safety. It is proven where respondents chose designated LZ sites in their front lawn, rather than other available options. While the author believes that this is caused by typical rural conditions, remoteness and Dutch consumers preference for more convenience (Azevedo, 2013).

Overall, the results of the suitability analysis of LZ is a reasonable estimate given that drones are constantly improving. Experts in the Netherlands have tested a large number of drones for goods delivery. Finding suitable LZs are likely play a much smaller role in considerations once there is clear regulatory package in place. For example, some limitations such as no-fly zone could not be used in this research because drone regulation for commercial drones does not exist yet. In order to support this new technology in the freight sector, there is a need for developing new zoning regulations in aviation to prevent collision with low-flying aircraft. In regards to regulations, rooftops as one of the possibilities for drones to land may require roof design of residential homes to be considered in the near future.

Improvement to the Survey

First, ‘Feeling about package delivery anywhere on your lawn’ should be emphasized within the context of safety LZ to get the clear outcome of perceived safe LZ. This question could

have been improved with a better explanation. Second, the answer options, such as level of agreement and likert scale of positive statement could have been replaced with numbers for easy interpretation and analysis purposes. Lastly, a larger sample size would be advantageous in order to obtain more reliable results.

Recommendation for further Research

Since rural areas become a place where research and experiments are conducted, it is reasonable to expect that the first drones will be deployed there as well. According to the findings of this study, respondents support the use of drones for either delivery of goods or medical purposes. Operating in rural areas provides many opportunities, since these areas are difficult to reach or lack of medical resources. Furthermore, this research does not include the actual drone experiments, thus the result of public acceptance may be skewed. This is consistent with the views of Clothier et al. (2015), who believes that when drones are used or experienced by local residents, the perception will likely to change. For instance, the Tan et al. (2021) article states that participants in a study conducted in the United States perceived darker drone colours as more threatening. Besides, the findings of this study indicated that the male population was more knowledgeable about drones. A future study might look into the female population's lack of interest. The author believes that interest will increase in the future if societal benefits are realized. This research has also provided preliminary evidence of anxiety-based reasons that might affect public acceptance of or support for drones application and can be a useful consideration for further research endeavours. Last but not least, because these three locations are close to nature reserves, it is necessary to include fauna to avoid drone delivery disruption.

References

Albrecht, C. (2021). *Manna now doing 50-100 drone deliveries per day in Galway, Ireland.* Retrieved on September 28, 2021 from https://thespoon.tech/manna-now-doing-50-100-drone-deliveries-per-day-in-galway-ireland/.

Aydin, B. (2019). Public acceptance of drones: Knowledge, attitudes and practices. *Technology in Society,* 59.

Azevedo, H. (2013). *Dutch Consumers Want Choices and Convenience When Shopping Online.* Retrieved on January 14, 2022 from https://www.comscore.com/Insights/online_shopping/Dutch-Consumers-Want-Choices-And-Convenience-When-Shopping-Online.

Behrends, S., Lindholm, M. & Woxenius, J. (2008). The impact of urban freight transport: A definition of sustainability from an actor's perspective. *Transportation planning and technology*, *31*(6), 693-713.

Bektash, O., Pedersen, J. N., Gomez, A. R. & la Cour-Harbo, A. (2020). *Automated Emergency Landing System for Drones: SafeEYE Project.*

Carney, E., Castano, L. & Xu, H. (2019). Determination of Safe Landing Zones for an Autonomous UAS using Elevation and Population Density Data. *AAIA SciTech Forum*.

Chakravarti, R., Iwai, S. & Wijewardane, S. (2021). *Strategies to improve social acceptability of drones.* Max Bell School of Public Policy: Canada.

Chiang, W. C., Li, Y., Shang, J. & Urban, T. L. (2019). Impact of drone delivery on sustainability and cost: Realizing the UAVs potential through vehicle routing optimization. *Applied Energy,* 242, 1164-1175.

Cullinane, S. (2014). Mitigating the negative environmental impacts of long-haul freight transport. In Macharis, C., Melo, S., Woxenius, J., van Lier, T. (Ed). *Sustainable Logistics Vol. 6* (pp. 31-61). Bingley: Emerald.

Fisher, S. (2020). *Ethical issues to consider when conducting survey research*. Retrieved on October 10, 2021 from https://www.qualtrics.com/blog/ethical-issues-for-online-surveys/.

Gonzales-Feliu, J. (2018). *Sustainable Urban Logistics: Planning and Evaluation*. London: ISTE Ltd.

Guerin, J., Delmans, K., & Guiochet, J. (2021). *Certifying Emergency Landing for Safe Urban UAV.*

Haig, T. (2019). *Drone and crewed aircraft 'incidents' increase in Canadian Skies.* Retrieved on January 13, 2021 from https://www.rcinet.ca/en/2019/08/09/drone-and-crewed-aircraft-incidents-increase-in-canadian-skies/.

Heutger, M. & Kückelhaus, M. (n. d.). *Unmanned Aerial Vehicles in Logistics: A DHL perspective on implication and use cases for the logistics industry.* Troisdorf: DHL Customer Solutions & Innovation.

Hong, I., Kuby, M. & Murray, A. T. (2018). A range-restricted recharging station coverage model for drone delivery service planning. *Transportation Research Part C,* 90, 198-212.

Ignet. (2017). Retrieved on October 15, 2021 from https://www.ignet.gov/sites/default/files/files/14_Questionnaire_Pretest_Procedures.pdf.

Jaramillo, F. P., Shih, K. H. & Cheng, C. C. (2019). Can Drones Deliver Food? What the Food Delivery Industry Needs to Know. *International Journal of Performance Measurement*, 9(2), 41-62.

Joerss, M., Schröder, J., Neuhaus, F., Klink, C. & Mann, F. (2016). *Parcel delivery: The future of last mile.*

Kadastrale Kaart Buurt Anloo, n.d. *Buurt: Anloo.* Retrieved on November 28, 2021 from https://kadastralekaart.com/buurten/anloo-BU16800200.

Kadastrale Kaart Buurt Gasteren. n.d. *Buurt: Gasteren*. Retrieved on November 28, 2021 from https://kadastralekaart.com/wijken/wijk-03-gasteren-WK168003.

Kadastrale Kaart Buurt Zeegse. n.d. *Buurt: Zeegse*. Retrieved on November 28, 2021 from https://kadastralekaart.com/buurten/zeegse-BU17301400

Klauser, F. & Pedrozo, S. (2017). Big data from the sky: popular perception of private drones in Switzerland. *Geogr, Helv.,* 72, 231-239.

Loureiro, G. (2020). Survey of approaches for emergency landing spot detection with Unmanned Aerial Vehicles. *CLAWAR*.

Lee, J. K., Kim, S. H. & Sim, G. R. 2019. Mode choice behavior analysis of air transport on the introduction of remotely piloted passenger aircraft. *Journal of Air Transport Management,* 76, 48-55.

Mejias, L., Fitzgerald, D. L., Eng, P. C. & Xi, L. (2009). Forced landing technologies for unmanned aerial vehicles: towards safer operations. In Thanh Mung, Lam (Ed.) *Aerial Vehicles,* 413-440.

Morganti, E., Seidel, S., Blanquart, C., Dablanc, L. & Lenz, B. (2014). The impact of e-commerce on final deliveries: alternative parcel delivery service in France and Germany. *Transportation Research Procedia,* 4, 178-190.

Natura2000. (2008). *Protecting Europe's Biodiversity.* Oxford: Information Press.

Nguyen, D. H. (2019). Developing Models for Managing Drones in the Transportation System in Smart Cities**.** *Electrical, Control and Communication Engineerin*g, 15(2), 71-78.

Park, J., Kim, S. & Suh, K. (2018). A comparative Analysis of the Environmental Benefits of Drone-Based Delivery Services in Urban and Rural Areas

Punch, K. F. (2014). *Introduction to Social Research: Quantitative and Qualitative Approach.* London: SAGE Publication.

PWC. (2016). Clarity from above.

Reddy, L. B. & DeLaurentis, D. (2016). Opinion Survey to Reduce Uncertainty in Public and Stakeholder Perception of Unmanned Aircraft. *Transportation Research Board,* 2600, 80-93.

Sanders, C. (2020). *Beyond visual line of sight commercial unmanned aircraft operations: site suitability for landing zone locations.*

Savills (2020). *The challenge of rural logistics*. Retrieved on September 24, 2021 from https://www.savills.com/research_articles/255800/307368-0.

Williams, R. (2021). How delivery drones are already helping fulfil orders for coffee, takeaways and books. Retrieved on October 11, 2021 from https://inews.co.uk/news/technology/how-delivery-drones-already-helping-fulfil-orders-coffee-takeaways-books-1119582.

Yoo, W., Yu, E. & Jung, J. (2018). Drone delivery: factors affecting the public's attitude and intention to adopt. *Telematics and Informatics,* 35, 1687-1700.

Wang, C., Lan, H., Saldanha-da-Gama, F. & Chen, Y. (2021). On Optimizing a Multi-Mode Last-Mile Parcel Delivery System with Vans, Truck and Drone. *Electronics,* 10(20), 2510.

Wingcopter. (n.d.). Wingcopter 198. Retrieved on December 9, 2021 from https://wingcopter.com/wingcopter-198.

Appendices

Overview

- Appendix 1: Methodological Approaches
- Appendix 2: Questionnaire Design
- Appendix 3: Statistical Analysis
- Appendix 4: GIS Analysis
- Appendix 5: Survey Distribution Flyer

Appendix 1: Methodological Approach

	Which information	Particular moment of collection	Sources will you use/how to obtain this data?	Documentation/How will this data be archived?	Analysis of the data
Main RQ: How does safe landing location influence the public acceptance regarding use of drone as goods delivery in rural areas in Drenthe?	Types of safe landing location, KAP result, influence safe landing zone towards public acceptance	During data collection	Influence → SPSS Safe landing zones → GIS Analysis Public perception → Survey data	This main research question will be answered using the data from the three sub-questions. This will be documented in the thesis and the empirical data section will be explained in the methodology part of the research.	Data will be based on the combination of theories and literature from sub-question 2 and 3 and the empirical data gathered and analysed in sub-question 1.
Sub Q1: What is the perception of inhabitants of rural area in Drenthe regarding the use of drone as goods delivery service?	Definition of KAP, Knowledge, Attitude and Practice from public perception about drone as goods delivery	Data collection	Qualtrics, via surveys within the buffered-area	Data will be archived in Qualtrics, Excel, SPSS files. Eventually described in thesis. Data files are deleted when thesis finalized	Data will be analysed in Excel and SPSS

Sub Q2: Does the potential benefit can increase inhabitants of rural area in Drenthe trust to use drone as goods delivery service?	Benefit of using Drone as a Service for goods delivery Perceived benefit of using drone as good delivery from the inhabitants of Drenthe	Writing theoretical framework before data collection Data collection	Academic literature, newspaper, policy documents Qualtrics, via surveys within the buffered-area	Data will be archived in Qualtrics, Excel, SPSS files. Eventually described in thesis. Data files are deleted when thesis finalized	Reading articles, paraphrasing the articles and after conducting a survey the data will be analysed in Excel and SPSS
Sub Q3: What is the suitable topographical condition to locate safe landing zone for drone as goods delivery service of chosen rural area in Drenthe?	Topographical conditions requirement, GIS tools	Desk research	Academic literature, GIS data (e.g. elevation map, air-traffic map, and population density), empirical findings.	Data will be archived in ArcGIS and Qualtrics for survey reason. Eventually described in thesis. Data files are deleted when thesis finalized.	Data will be analysed in GIS to determine safe LZ for drone delivery.

Appendix 2: Questionnaire Design

This questionnaire design will be distributed to two potential locations within Province of Drenthe. The result will be used as comparative analysis between two different rural areas to see whether or not the inhabitants of Drenthe accept the potential of drone uses with proposing suitable and safety LZ. This table performs list of questions, measurement level, answer options and aim of the questions have explained in this part.

Q	Question	Measurement level (nominal, ordinal, interval, ratio)	Answer options	What does the question aim to identify?
Introduction				
Dear respondents, *Thank you for agreeing to fulfill this survey. This survey is conducted by Jennifer Septiana as third-year Spatial Planning and Design student at Rijksuniversiteit of Groningen.* *Shopping habits in Europe have rapidly changed over the last decade and large proportion of consumers now prefer to shop online. Drone are gaining popularity for delivery service of small package in urban areas. Thus, drones are seen as innovative solution to the drawback of conventional delivery methods, such as cars or trucks which extremely associated with heavy road traffic and environmental pollution. Moreover, it is crucial to understand public' understanding of drone technology, the potential advantages of drone technology in their daily lives and ear and concern towards this new technology.* *This survey contains a video about drones as a service for goods delivery and 20 questions. This survey is anonymous and the result will be used for research purpose and will be destroyed at last. Upon completing this survey, you will have chance to win 1 gift card from bol.com.*				

Beste Meneer/Mevrouw, *Hartelijk bedankt voor het invullen van de enquête. Mijn naam is Jennifer Septiana en ik schrijf op dit moment mijn afstudeeronderzoek aan de Rijksuniversiteit Groningen. Ik doe onderzoek naar drones die worden ingezet om pakketjes te bezorgen. Ik ben benieuwd hoe mensen hierover denken en waar we dan onze pakketjes willen laten bezorgen bijvoorbeeld.* *De enquête bevat een informatieve video en 20 vragen. Het duurt maximaal 8 minuten. De enquête is anoniem en de resultaten zullen worden gebruikt voor onderzoek. De data zal worden verwijderd na het afronden van het onderzoek. Tot slot, na het invullen van de enquête kunt u kans maken om een giftcard te winnen van Bol.com.*				
1	Where do you live? *Waar woont u?*	Nominal	□ Zeegse □ Gasteren □ Anloo	N/A
2	How old are you? *Hoe oud bent u?*	Ordinal	0-18, 18-35, 35-50, 50-65, 66+	Based on the author finding, socio-demographic data determine public acceptance level of drone.
3	What is your gender? *Wat is uw geslacht?*	Nominal	□ Female *Vrouw* □ Male *Man* □ Others *Anders* □ Rather not to say *Zeg ik liever niet*	Based on the author finding, socio-demographic data determine public acceptance level of drone.

4	What is your last education level? *Wat is uw hoogst behaalde opleidingsniveau?*	Nominal	□ Basisschool □ Middelbare school □ MBO □ HBO □ WO □ Other, please specify *Anders, graag noteren*	Based on the author finding, socio-demographic data determine public acceptance level of drone.
5	How often do you buy goods online? *Hoe vaak koopt u producten online?*	Nominal	□ At least once in a month *Minstens één keer in de maand* □ Once in a week *Een keer in de week* □ More than twice a week *Meer en twee keer in de week* □ Never *Nooit*	The question aims to investigate on how many time people use delivery service. This will help to gain an insight of potential of the usage of drone as a service for good delivery.
6	Have you ever faced any issue when receiving your package? *Heeft u ooit een probleem gehad met de levering van uw pakketje?*	Nominal	□ Arrived late *Te laat gearriveerd* □ Stolen package *Gestolen* □ Broken package *Kapot afgeleverd* □ I have no problem *Ik heb nooit problemen gehad*	Allows for the opportunity to investigate the problem of conventional delivery.

7	When you receive a parcel at your home, where are these typically dropped? *Wanneer u een pakketje thuis ontvagt, waar bij uw huis wordt het die afgeleverd?*	Nominal (multiple answers)	□ Front door *Bij voor deur* □ Mailbox *In de brieven bus*	The question aims to identify customer preference about location when parcels are delivered. This question will be used as consideration for drone landing zone in this analysis followed by Question 13.
8	When you are not home, where do you prefer the courier leave your parcel? *Wanneer u niet thuis bent, waar zou u willen dat uw pakketje wordt afgeleverd?*	Nominal (multiple answers)	□ Office *Op kantoor* □ Neighbor *Bij de buren* □ Porch *De voortuin* □ Pick up point or Parcel lockers (if available in your area) *Afhaal locatie of Pakketluis (indien die aanwezig zijn in uw omgeving)*	The question aims to identify customer preference about location when parcels are delivered. This question will be used as consideration for drone landing zone in this analysis followed by Question 13.
Public perception towards drones as goods delivery - Knowledge				
9	Are you familiar with drones? *Bent u bekend met drones?*	Ordinal	□ Never familiar *Niet bekend* □ Rarely familiar *Een beetje bekend* □ Sometimes familiar *Algemeen bekend*	This question aims to identify respondents understanding with drone based on KAP model by Aydin (2019).

			□ Often familiar *Redelijk bekend* □ Very familiar *Erg bekend*	
Public perception towards drones as goods delivery – Attitude (For online survey, the authors will provide video about example of drone delivery with showing potential benefit of using drone (e.g. fast delivery, unbroken parcel, etc))* Introduction for door-to-door survey, *"Nederland is zich aan het voorbereiden op nieuwe vormen van mobiliteit. Drones kunnen daar onderdeel van zijn. Drones kunnen bijdragen aan het verminderen van files, grote plekken als havens inspecteren en beveiligen, en medicijnen altijd op de juiste tijd afleveren. Er worden onderzoeken en experimenten om te kijken hoe dit op een zo veilig en prettig mogelijke manier kan."*				
10	What is your first reaction to parcel deliveries by drones in your community? *Wat is jouw eerste reactive kijkend naar drones die goederren afleveren?*	Ordinal	□ Very positive *Erg positief* □ Somewhat positive *Enigszins positief* □ Somewhat negative *Enigszins negatief* □ Very negative *Erg negatief*	This question aims to investigate public level acceptance towards drone technology when it operates in public spaces as described by Aydin (2019).
11	Would you support drone application for parcel delivery purpose?	Ordinal	□ Fully Agree *Geheel voor* □ Slightly Agree	This question aims to identify customer's perspective about drone delivery since customer plays

	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?		*Voor* □ Neutral *neutraal* □ Slightly Disagree *tegen* □ Fully Disagree *Geheel tegen*	important role on B2C service (Aydin, 2019; Clothier et al., 2019)
12	Would you support drone application for First-aid purpose? *Bent u voor of tegen het gebruik van drones bij de eerste hulp?*	Ordinal	□ Fully Agree *Geheel voor* □ Slightly Agree *voor* □ Neutral *neutraal* □ Slightly Disagree *tegen* □ Fully Disagree *Geheel tegen*	This question aims to identify public level of attitude with drone operation. The result will be used for comparison of drone as a service for goods delivery and other purposes of drone.
13	Would you support drone application for military purpose? *Bent u voor of tegen het gebruik van drones voor militaire doeleinden?*	Ordinal	□ Fully Agree *Geheel voor* □ Slightly Agree *Voor* □ Neutral *neutraal*	This question aims to identify public level of attitude with drone operation. The result will be used for comparison of drone as a service for goods delivery and other purposes of drone.

			□ Slightly Disagree *tegen* □ Fully Disagree *Geheel tegen*	
Public perception towards drones as goods delivery - Practice				
14	Would you trust drones to deliver your package? *Heeft u vetrouwen in drones die uw pakketjes afleveren?*	Nominal	□ Yes, for any product *Ja, voor elk product* □ Yes, for a low value product *Ja, voor producten met een lage waarde* □ I have not considered this as delivery option *Ik heb het niet als afleveringsoptie beschouwd* □ No *Nee* □ I don't know *Weet ik niet*	This question aims to measure the public level of practice with drone operation as goods delivery. This will determine various concerns about drone operation as goods delivery (Aydin, 2019).
15	What makes you anxious about drone delivery? *Welke zorgen heeft u over drones als bezorgmiddel?*	Nominal (multiple answers)	□ Damages to packages *Beschadiging van pakketjes* □ Drone getting stolen/hacked *Drones die worden gestolen of gehackt* □ Drones replacing jobs *Drones die bezorgberoepen overnemen*	This question aims to identify the causes of the respondents about using drone as goods delivery. This will determine various concerns about drone operation as goods delivery (Aydin, 2019).

			□ Higher cost *Hogere kosten* □ Less privacy *Minder privacy* □ Cluttered airspace *Rommelig luchtruim* □ Accidents *Ongelukken* □ Nothing makes me anxious *Er niks waar ik zorgen over heb* □ Other, please specify *Anders, graag noteren*	
			Towards safe landing locations	
16	How would you feel about package delivered anywhere on your front lawn? *Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?*	Ordinal	□ Very positive *Erg positief* □ Somewhat positive *Enigszins positief* □ Somewhat negative *Enigszins negatief* □ Very negative *Erg negatief* □ Not applicable *Niet van toepassing*	This question aims to identify whether respondents feel safe to have package delivered anywhere in their lawn.

17	If you could pinpoint your preferred delivery location for packages delivery by drones, which landing zone would you pick? *Als u kunt aanwijzen waar uw voorkeurslocatie van landing is, waar zou dat zijn?*	Nominal	□ On your private property *Op eigen terrein* □ On designated landing zone in your street *Op aangewezen landingszone in uw wijk* □ On designated landing zone in the centre of the village *Op aangewezen landingszone in het centrum van uw dorp* □ On the designated landing zone at the edge of town *Op aangewezen landingszone in de buiten wijken*	This question allows the respondents to decide where suitable location would they prefer as landing zone for goods delivery by drone.
18	How will you collect your parcel? *Hoe halt u het pakketje op?*	Nominal	□ By foot *Lopend* □ By bike *Op de fiets* □ By car *Met de auto*	The question allows us to see customer preference of collecting their parcel and thus determine and conclude the suitable landing zone by respondent' preference.
19	Would you like to have the chance to win a bol.com gift card from us?	Nominal	□ Yes, and I am aware of the Terms and Conditions *Ja, en ik ben bekend met de voorwaarden (graag, vul uw emailadres hierin)* □ No, I want my survey to be anonymous	N/A

	Wilt u kans maken op een bol.com cadeaukaart t.w.v. €50,-?		*Nee, ik wil anoniem blijven*	
20	Would you like to receive the final result from this research? *Wilt u graag uitslag van dit onderzoek?*	Nominal	☐ Yes, and I am aware of the Terms and Conditions *Ja, en ik ben bekend met de voorwaarden (graag, vul uw emailadres hierin)* ☐ No, I want my survey to be anonymous *Nee, ik wil anoniem blijven*	N/A

Thank you for your participation. In order to win the gift box or receive final result from this research, you will be obligated to submit your email address. Thus, the result will not be anymore. However, the email address is only used for the purpose of winning the gift box and newsletter. Therefore, the survey will be anonymized again and the email addresses compilation will be destroyed at last.

Bedankt voor het mee doen met enquête. Als u wilt meedoen met de gift card en/of het resultaat van het onderzoek wilt ontvangen, vragen wij u om uw emailadres op te geven. Het emailadres wordt alleen gebruikt voor het winnen van de gift card en de uitslag van dit onderzoek. Daarna zullen alle contact gegevens verwijderd worden.

Appendix 3: Statistical Analysis

Questions are written in Dutch in order to accurately reflect how respondents interpreted the questions.

General information

Q1: Where do you live?

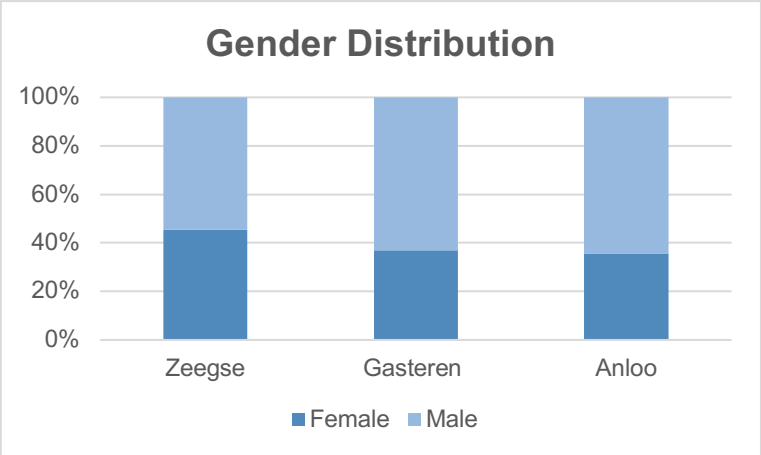
Waar ben je?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Zeegse	11	25.0	25.0	25.0
	Gasteren	19	43.2	43.2	68.2
	Anloo	14	31.8	31.8	100.0
	Total	44	100.0	100.0	

Q2: What is your gender?

Waar ben je? * Wat is uw geslacht? Crosstabulation

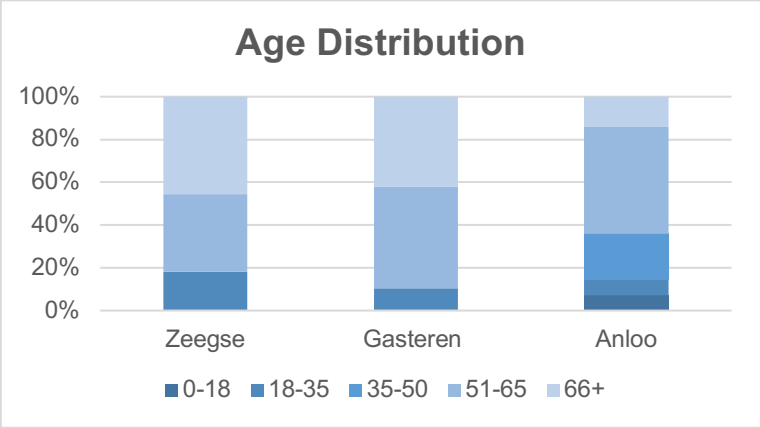
			Wat is uw geslacht? Vrouw	Man	Total
Waar ben je?	Zeegse	Count	5	6	11
		Expected Count	4.3	6.8	11.0
		% within Waar ben je?	45.5%	54.5%	100.0%
	Gasteren	Count	7	12	19
		Expected Count	7.3	11.7	19.0
		% within Waar ben je?	36.8%	63.2%	100.0%
	Anloo	Count	5	9	14
		Expected Count	5.4	8.6	14.0
		% within Waar ben je?	35.7%	64.3%	100.0%
Total		Count	17	27	44
		Expected Count	17.0	27.0	44.0
		% within Waar ben je?	38.6%	61.4%	100.0%



Q3: How old are you?

Waar ben je? * Hoe oud bent u? Crosstabulation

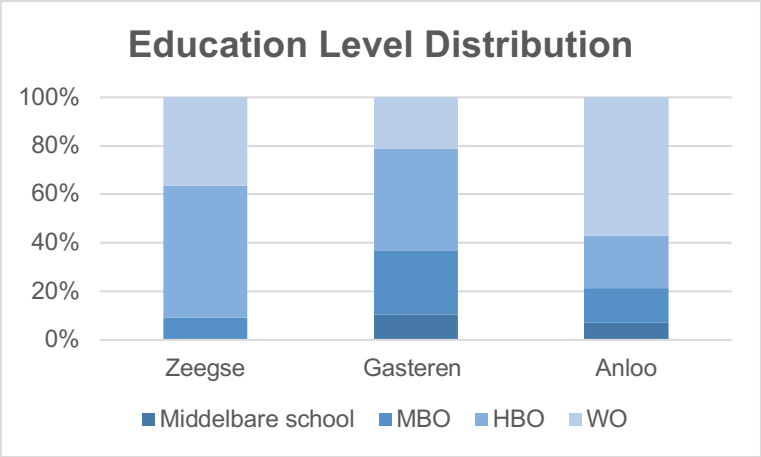
			Hoe oud bent u?					
			0-18 jaar	19-35 jaar	36-50 jaar	51-65 jaar	66+ jaar	Total
Waar ben je?	Zeegse	Count	0	2	0	4	5	11
		Expected Count	.3	1.3	.8	5.0	3.8	11.0
		% within Waar ben je?	0.0%	18.2%	0.0%	36.4%	45.5%	100.0%
	Gasteren	Count	0	2	0	9	8	19
		Expected Count	.4	2.2	1.3	8.6	6.5	19.0
		% within Waar ben je?	0.0%	10.5%	0.0%	47.4%	42.1%	100.0%
	Anloo	Count	1	1	3	7	2	14
		Expected Count	.3	1.6	1.0	6.4	4.8	14.0
		% within Waar ben je?	7.1%	7.1%	21.4%	50.0%	14.3%	100.0%
Total		Count	1	5	3	20	15	44
		Expected Count	1.0	5.0	3.0	20.0	15.0	44.0
		% within Waar ben je?	2.3%	11.4%	6.8%	45.5%	34.1%	100.0%



Q4: What is your last education level?

Waar ben je? * Wat is uw hoogst behaalde opleidingsniveau? - Selected Choice Crosstabulation

			Wat is uw hoogst behaalde opleidingsniveau? - Selected Choice				
			Middelbare school	MBO	HBO	WO	Total
Waar ben je?	Zeegse	Count	0	1	6	4	11
		Expected Count	.8	2.0	4.3	4.0	11.0
		% within Waar ben je?	0.0%	9.1%	54.5%	36.4%	100.0%
	Gasteren	Count	2	5	8	4	19
		Expected Count	1.3	3.5	7.3	6.9	19.0
		% within Waar ben je?	10.5%	26.3%	42.1%	21.1%	100.0%
	Anloo	Count	1	2	3	8	14
		Expected Count	1.0	2.5	5.4	5.1	14.0
		% within Waar ben je?	7.1%	14.3%	21.4%	57.1%	100.0%
Total		Count	3	8	17	16	44
		Expected Count	3.0	8.0	17.0	16.0	44.0
		% within Waar ben je?	6.8%	18.2%	38.6%	36.4%	100.0%



Q5: How often do you buy goods online?

Waar ben je? * Hoe vaak koopt u producten online? Crosstabulation

			Hoe vaak koopt u producten online?				
			Minstens een keer in de maand	Één keer in de week	Meer dan twee keer in de week	Nooit	Total
Waar ben je?	Zeegse	Count	7	2	2	0	11
		Expected Count	6.8	2.5	1.5	.3	11.0
		% within Waar ben je?	63.6%	18.2%	18.2%	0.0%	100.0%
	Gasteren	Count	13	3	2	1	19
		Expected Count	11.7	4.3	2.6	.4	19.0
		% within Waar ben je?	68.4%	15.8%	10.5%	5.3%	100.0%
	Anloo	Count	7	5	2	0	14
		Expected Count	8.6	3.2	1.9	.3	14.0
		% within Waar ben je?	50.0%	35.7%	14.3%	0.0%	100.0%
Total		Count	27	10	6	1	44
		Expected Count	27.0	10.0	6.0	1.0	44.0
		% within Waar ben je?	61.4%	22.7%	13.6%	2.3%	100.0%

Q6: Have you ever faced any issue when receiving your package?

Q1*$Q6 Crosstabulation

			Issue when receiving package[a]				
			Heeft u ooit een probleem gehad met de levering van uw pakketje? Te laat gearriveerd	Heeft u ooit een probleem gehad met de levering van uw pakketje? Gestolen	Heeft u ooit een probleem gehad met de levering van uw pakketje? Kapot afgeleverd	Heeft u ooit een probleem gehad met de levering van uw pakketje? Ik heb nooit problemen gehad	Total
Waar ben je?	Zeegse	Count	5	0	3	5	11
		% within Q1	45.5%	0.0%	27.3%	45.5%	
	Gasteren	Count	8	2	2	10	19
		% within Q1	42.1%	10.5%	10.5%	52.6%	
	Anloo	Count	7	1	1	6	14
		% within Q1	50.0%	7.1%	7.1%	42.9%	
Total		Count	20	3	6	21	44

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

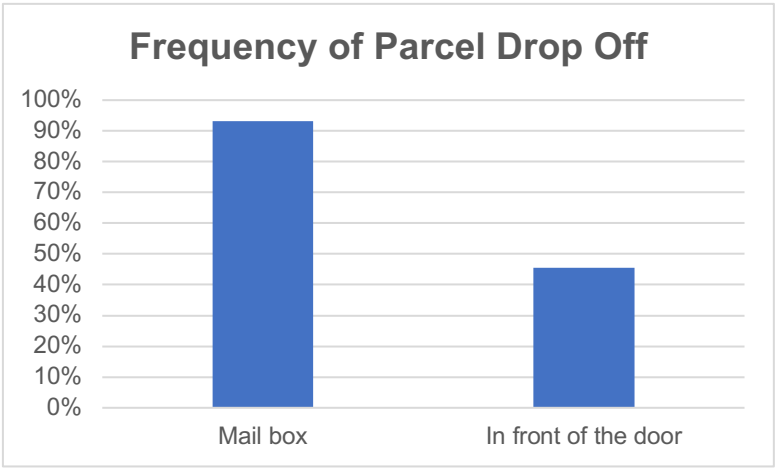
Q7: When you receive a parcel at your home, where are these typically dropped?

Q1*$Q7 Crosstabulation

			Parcel are typically dropped[a]		
			Wanneer u een pakketje thuis ontvangt, waar bij uw huis wordt het afgeleverd? De voordeur	Wanneer u een pakketje thuis ontvangt, waar bij uw huis wordt het afgeleverd? In de brievenbus	Total
Waar ben je?	Zeegse	Count	10	6	11
		% within Q1	90.9%	54.5%	
	Gasteren	Count	18	10	19
		% within Q1	94.7%	52.6%	
	Anloo	Count	13	4	14
		% within Q1	92.9%	28.6%	
Total		Count	41	20	44

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.



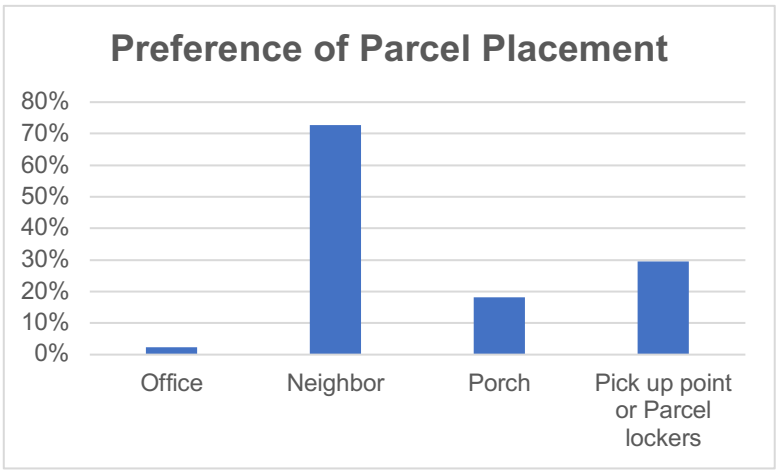
Q8: When you are not home, where do you prefer the courier leave your parcel?

Q1*$Q8 Crosstabulation

			Preferable location[a]				
			Wanneer u niet thuis bent, waar zou u willen dat uw pakketje wordt afgeleverd? Op kantoor	Wanneer u niet thuis bent, waar zou u willen dat uw pakketje wordt afgeleverd? Bij de buren	Wanneer u niet thuis bent, waar zou u willen dat uw pakketje wordt afgeleverd? De voortuin	Wanneer u niet thuis bent, waar zou u willen dat uw pakketje wordt afgeleverd? Afhaal locatie of Pakketluis (indien die aanwezig zijn in uw omgeving)	Total
Waar ben je?	Zeegse	Count	0	7	4	6	11
		% within Q1	0.0%	63.6%	36.4%	54.5%	
	Gasteren	Count	0	14	3	5	19
		% within Q1	0.0%	73.7%	15.8%	26.3%	
	Anloo	Count	1	11	1	2	14
		% within Q1	7.1%	78.6%	7.1%	14.3%	
Total		Count	1	32	8	13	44

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.



Analysis between Q9 and Q1 – Kruskal Wallis

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Bent u bekend met drones?	44	2.86	1.069	1	5
Waar ben je?	44	2.07	.759	1	3

Kruskal-Wallis Test

Ranks

	Waar ben je?	N	Mean Rank
Bent u bekend met drones?	Zeegse	11	17.55
	Gasteren	19	23.63
	Anloo	14	24.86
	Total	44	

Test Statistics[a,b]

	Bent u bekend met drones?
Kruskal-Wallis H	2.437
df	2
Asymp. Sig.	.296

a. Kruskal Wallis Test

b. Grouping Variable: Waar ben je?

Analysis between Q9 and Q2 – Spearman Rho | Support Sub-question 1

Correlations

			Hoe oud bent u?	Bent u bekend met drones?
Spearman's rho	Hoe oud bent u?	Correlation Coefficient	1.000	-.159
		Sig. (2-tailed)	.	.302
		N	44	44
	Bent u bekend met drones?	Correlation Coefficient	-.159	1.000
		Sig. (2-tailed)	.302	.
		N	44	44

Analysis between Q9 and Q3 – Mann-Whitney | Support Sub-question 1

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Bent u bekend met drones?	44	2.86	1.069	1	5
Wat is uw geslacht?	44	1.61	.493	1	2

Mann-Whitney Test

Ranks

	Wat is uw geslacht?	N	Mean Rank	Sum of Ranks
Bent u bekend met drones?	Vrouw	17	15.26	259.50
	Man	27	27.06	730.50
	Total	44		

Test Statistics[a]

	Bent u bekend met drones?
Mann-Whitney U	106.500
Wilcoxon W	259.500
Z	-3.082
Asymp. Sig. (2-tailed)	.002

a. Grouping Variable: Wat is uw geslacht?

Analysis between Q9 and Q4 – Kruskal Wallis | Support Sub-question 1

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Bent u bekend met drones?	44	2.86	1.069	1	5
Wat is uw hoogst behaalde opleidingsniveau? - Selected Choice	44	4.05	.914	2	5

Kruskal-Wallis Test

Ranks

	Wat is uw hoogst behaalde opleidingsniveau? - Selected Choice	N	Mean Rank
Bent u bekend met drones?	Middelbare school	3	20.33
	MBO	8	21.25
	HBO	17	22.94
	WO	16	23.06
	Total	44	

Test Statistics[a,b]

	Bent u bekend met drones?
Kruskal-Wallis H	.229
df	3
Asymp. Sig.	.973

a. Kruskal Wallis Test

b. Grouping Variable: Wat is uw hoogst behaalde opleidingsniveau? - Selected Choice

Analysis between Q10 and Q11 – Spearman's rho | Support Sub-question 2

Correlations

			Wat is jouw eerste reactie kijkend naar drones die goederen afleveren?	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?
Spearman's rho	Wat is jouw eerste reactie kijkend naar drones die goederen afleveren?	Correlation Coefficient	1.000	.728**
		Sig. (2-tailed)	.	.000
		N	44	44
	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	Correlation Coefficient	.728**	1.000
		Sig. (2-tailed)	.000	.
		N	44	44

**. Correlation is significant at the 0.01 level (2-tailed).

Analysis between Q10 and Q11, Q12 and Q13 – Spearman's rho

Correlations

			Wat is jouw eerste reactie kijkend naar drones die goederen afleveren?	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	Bent u voor of tegen het gebruik van drones bij de eerste hulp?	Bent u voor of tegen het gebruik van drones voor militaire doeleinden?
Spearman's rho	Wat is jouw eerste reactie kijkend naar drones die goederen afleveren?	Correlation Coefficient	1.000	.728**	.381*	.021
		Sig. (2-tailed)	.	.000	.011	.893
		N	44	44	44	44
	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	Correlation Coefficient	.728**	1.000	.315*	-.104
		Sig. (2-tailed)	.000	.	.038	.503
		N	44	44	44	44
	Bent u voor of tegen het gebruik van drones bij de eerste hulp?	Correlation Coefficient	.381*	.315*	1.000	.060
		Sig. (2-tailed)	.011	.038	.	.698
		N	44	44	44	44
	Bent u voor of tegen het gebruik van drones voor militaire doeleinden?	Correlation Coefficient	.021	-.104	.060	1.000
		Sig. (2-tailed)	.893	.503	.698	.
		N	44	44	44	44

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Analysis between Q11 and Q14 – Kruskal Wallis | Support Sub-question 2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Heeft u vertrouwen in drones die uw pakketje afleveren?	44	2.20	1.193	1	5
Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	44	2.55	.975	1	5

Kruskal-Wallis Test

Ranks

	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	N	Mean Rank
Heeft u vertrouwen in drones die uw pakketje afleveren?	Geheel voor	6	10.08
	voor	16	18.63
	neutraal	15	29.13
	tegen	6	25.83
	Geheel tegen	1	39.50
	Total	44	

Test Statistics[a,b]

	Heeft u vertrouwen in drones die uw pakketje afleveren?
Kruskal-Wallis H	14.574
df	4
Asymp. Sig.	.006

a. Kruskal Wallis Test

b. Grouping Variable: Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?

Analysis between Q16 and Q11 – Spearman's rho | Support Main Research Question

Correlations

			Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?
Spearman's rho	Bent u voor of tegen het gebruik van drones voor het afleveren van pakketjes?	Correlation Coefficient	1.000	.485**
		Sig. (2-tailed)	.	.001
		N	44	44
	Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?	Correlation Coefficient	.485**	1.000
		Sig. (2-tailed)	.001	.
		N	44	44

**. Correlation is significant at the 0.01 level (2-tailed).

Analysis between Q16 and Q14 – Kruskal Wallis

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Heeft u vertrouwen in drones die uw pakketje afleveren?	44	2.20	1.193	1	5
Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?	44	2.98	1.067	1	5

Kruskal-Wallis Test

Ranks

	Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?	N	Mean Rank
Heeft u vertrouwen in drones die uw pakketje afleveren?	Erg positief	4	11.38
	Enigszins positief	11	20.23
	Enigszins negatief	13	17.62
	Erg negatief	14	29.68
	Niet van toepassing	2	38.75
	Total	44	

Test Statistics[a,b]

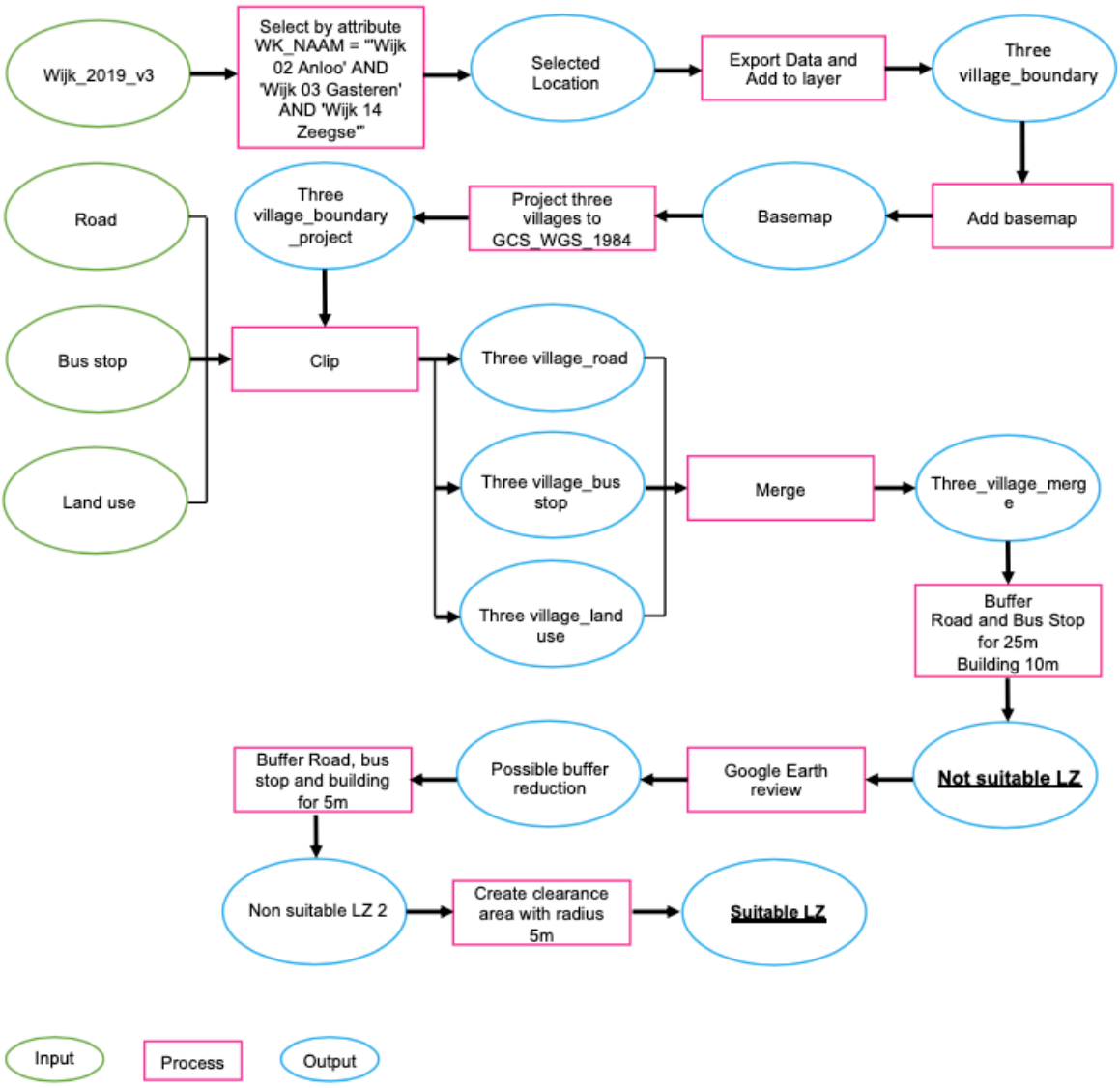
	Heeft u vertrouwen in drones die uw pakketje afleveren?
Kruskal-Wallis H	14.110
df	4
Asymp. Sig.	.007

a. Kruskal Wallis Test

b. Grouping Variable: Hoe denkt u erover als uw pakketje in de voortuin wordt afgeleverd?

Appendix 4: GIS Analysis

Flowchart to determine not suitable and suitable safe LZ



Appendix 5: Survey Distribution Flyer