

A Work Project, presented as part of the requirements for the Award of a Master's degree in
Management from the Nova School of Business and Economics.

Application of the Value Creation Wheel to increase the impact of Earth Observation on Urban Planning

VCW 2 - Identifying the Most Attractive Geographical Market for the Building's Monitoring Solution by
Latitudo 40

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Abstract:

Urban Planning enables functional cities while maintaining high quality of life for citizens. However, rapid urbanization and increasing effects of climate change are raising the need for sustainable urban areas worldwide. Earth Observation can provide valuable insights to local governments, allowing for more informed decisions and therefore helping to mitigate climate risk. For this individual contribution, close collaboration with Italian company Latitudo 40 was used for finding an attractive new geographical market for their Urban Heat Island monitoring solution. Application of the Value Creation Wheel identified the Petah Tikva subdistrict of Israel as the final target region.

Keywords: Innovation, Value Creation, Urban Planning, Earth Observation, Technological Markets

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1. Introduction

Urban planning is a key requirement for enabling functioning cities and providing a high quality of life to citizens (Taubenböck et al. 2010). However, rapid urbanization and the effects of climate change are a growing challenge for sustainable urban development (UNEP 2017). Global efforts such as the Paris Agreement and the Sustainable Development Goals (SDGs) have been undertaken to limit climate impact and enable a just transition towards a sustainable civilization (UN 2015a; UN 2017). On a municipal level, these efforts also translate into cities' Environmental, Social, and Governance (ESG) targets (McGrath 2020).

Until recently, in-situ sensors measured the urban environment to help with planning activities and achievement of ESG goals. This method is often resource intense, as it requires high up-front investments and continuous maintenance, as well as a certain degree of technical know-how by the municipality (D'Amico et al. 2020). Innovative solutions in the field of Earth Observation (EO) allow for remotely monitoring indicators such as urban heat, flood risk areas or building health with great accuracy and high cost efficiency (European Commission 2019b). Large datasets allow for in-depth analysis and thereby enable municipalities to support urban planning activities.

This Field Lab (FL) aims to apply the Value Creation Wheel (VCW) (Lages 2016) to three EO based urban planning solutions to identify attractive, new geographical markets of high impact. The work consists of four main sections. The first section gives a contextual overview on which this FL is based. The second section showcases the practical use of EO for urban planning, explains alignment with the SDGs and highlights current challenges. The third section introduces the VCW as a problem-solving tool for complex challenges and describes the five main framework phases. In the fourth section, the student's individual contributions will be presented. This includes the application of the VCW to an existing company and solution.

2. Literature Review

2.1. Urban Planning

Urban Planning describes the design and regulation of city spaces with regards to their physical appearance, economic function, and social impact on its citizens (Huxley and Inch 2020). Nowadays, city planning activities include a wide range of disciplines and activities with increasing complexity due to the need of anticipating future situations. The goal of urban planning is to successfully steer settlement development into a qualitative, liveable and sustainable direction (Taubenböck et al. 2010). Sustainable development is thereby defined as the process of meeting “[...] the needs of the present without compromising the ability of future generations to meet their own needs.” (Simon 1987, p. 8).

Historically, the need for modern urban planning activities emerged between the late 19th and early 20th century, as growing industrialized cities faced worsening sanitary, economic, and social conditions (McGill University 2015). In the beginning, civil engineers and architects formed the basis for practically all planning activities. Engineers were tasked with significant improvements to the city’s water supply and sewerage systems to enable constant urban population growth. Architects on the other hand saw an increasing amount of early regulatory laws regarding minimal standards for housing construction and safety to comply with. Later, public health experts and sociologists became involved, as the need for a better urban environment emerged. Green city spaces were built to offer a visual relief and relaxation opportunity for citizens. With increasing economic activities in cities (Lampard 1955), economists became involved in the planning process more frequently. To facilitate the movement of goods through the cities, pedestrian and vehicular traffic was separated, large transportation corridors and dedicated commercial spaces established. Lastly, the increasing use of motorized vehicles represented a significant factor for changing the

physical form of cities. Residential, industrial, and commercial districts could be further apart, as workers and goods moved more rapidly from one place to the other (McGill University 2015; Erickson 2012).

As the historical evolution shows, an increasing number of involved activities and responsibilities are required for urban planning. Ongoing developments such as climate change are additionally adding to the complexity of the process.

2.2. Climate Change Impact on Urban Environments

As of today, cities host over half of the global populations, with this number being forecasted to reach 70% by the mid-century (UNEP 2017). At the same time, the effects of climate change have an increasing impact on cities worldwide (Hunt and Watkiss 2011). Rising temperatures and sea levels cause a high frequency of extreme weather events to occur, such as floods, storms, or droughts. This heavily affects cities' basic services, local infrastructure, and overall citizen quality of life. Effects are thereby not limited to developing countries but are felt globally. São Paulo in Brazil was recently hit by severe droughts, bringing the local water supply reservoir to a fraction of its capacity, and forcing residents to strict water rationing (Purvis 2016). This year saw the US National Weather Service announcing a flash flood warning for New York City for the very first time after heavy rainfall caused streets, apartments, and subway lines to be flooded (Sullivan 2021). Additionally, in summer 2020, India experienced one of the strongest typhoons since the beginning of recordings. As a result, over 2.5 million people from densely populated areas had to be evacuated, as the tropical storm made landfall near Kolkata and threatened the 15 million inhabitant city. Economic damages were estimated at \$14b for the 5-day weather event (PTI 2021). Even without the direct destructive effects of extreme weather, cities are impacted by climate

change. Notable effects can be observed on human health and overall city infrastructure. Air pollution is already estimated to cause 7 million deaths per year globally, with current trends indicating a growing reason for concern (Schmale et al. 2014). Low air quality due to elevated amounts of fine particles in the atmosphere has severe health impacts. Human exposure to atmospheric pollutants has been shown to cause an overall cognitive decline, as well as increased premature mortality due to cardiovascular and respiratory diseases. The continuing degradation of air quality is expected to have a major impact on urban human health by the mid-21st century (Kumar 2021). Apart from causing health issues, particles in the air are also interconnected with climate change, as they influence local meteorology. As a result, increasing temperatures due to trapped heat, as well as interferences with humidity, windspeed or rainfall are further accelerating climate change and its effects (Kumar 2021; Schmale et al. 2014).

In addition to human health, and environmental factors, increasing urban temperatures are posing a risk to infrastructure safety. High air temperature causes the creation of Ozone near the surface, which has damaging effects on urban structures such as roads and buildings (Kumar 2021).

Resulting from the increasingly strong climate effects on cities and their negative impact on urban populations, adaptation to climate change is now at the core of many urban planning activities (Blanco et al. 2009).

2.3. International Climate Change Mitigation Efforts

When addressing the important challenge of climate change and guiding cities into a more sustainable direction through effective urban planning, a variety of different aspects and stakeholders must be considered. While it is not sufficient to only aim to reduce economic losses incurred by climate change, efforts must also incorporate an environmental and social benefit to

have a strong and lasting impact (Schweikert et al. 2018). In this context, the Triple Bottom Line (TBL) becomes relevant.

2.3.1. Triple Bottom Line

The TBL is a concept introduced by Elkington (2004) which advises firms to measure their impact in three dimensions instead of purely focusing on profit generation. These three pillars can be defined as Profit, Planet, and People – or the 3 Ps.

Profit is the historical standard bottom line in a capitalist economy. Firms are generally successful when they achieve good financial performance and therefore generate value (in the form of profit) for their shareholders. Planet describes the environmental impact of a company's business operations. Large corporations have significantly contributed to climate change since the industrial revolution and generally possess the necessary resources to help reduce their carbon footprint. This could be in the form of sourcing material in a sustainable way, lowering overall energy consumption, and optimizing shipping to reduce transportation emissions (Miller 2020). Lastly, People measure the social contribution of a firm. Instead of purely committing to shareholders, a wide range of stakeholders should be accounted for. With an increasing focus on sustainability, modern companies need to create value for all stakeholders affected by their business operations. This must naturally include customers, employees, and community members, but also humanity in general. Committing to people on a larger scale could mean partnering with external organizations and sharing a common goal to work towards (Kraaijenbrink 2019).

With respect to the TBL, several key measures were undertaken to address the urgent need for climate action.

2.3.2. COP 21 – 26 and the Paris Agreement

On a global scale, the Paris Agreement, resulting from the 21st Conference of the Parties (COP 21) in 2015, represents a landmark agreement for tackling climate change on a large scale by aiming to limit the average atmospheric warming to well below 2°C. The agreement is unique as it represents a legally binding document, committing all 196 signatory nations to undertake serious efforts to adapt to current climate change effects and limit its future increases. This includes both intensifying current actions and providing the required investments for a sustainable civilization. Individual states presented Nationally Determined Contributions (NDCs) to better track progress and reevaluate achievements in 5-year intervals (UN 2015a). The recently held COP 26 in Glasgow reviewed the realized progress since the Paris Agreement in 2015. While all countries confirmed their resolution of collaboratively achieving a global temperature rise of less than 2°C, it was found that many countries' individual ambitions had not been strong enough. Unfortunately, most of the major carbon-emitting countries had not set ambitious NDCs to achieve a 45% CO₂ emission reduction and resultingly net zero global emissions by the mid-century. Therefore, all countries were called upon to present significantly stronger individual commitments by next year (UN 2021a). To achieve that, industrialized countries are requested to provide \$100b in annual investments to less-developed nations for climate protection. In return, emerging countries are obliged to reinforce their climate protection measures through their own NDCs (bpb 2021).

2.3.3. Sustainable Development Goals

To establish a development framework for achieving a better and more sustainable future for humanity by the year 2030, the UN introduced the Sustainable Development Goals (SDGs) (UN 2017). The 17 SDGs address a wide range of urgent issues, from eliminating poverty and hunger, to reducing overall climate impact and protecting other species on earth, to building sustainable

cities and enabling decent economic growth. Thereby, each SDG is aligned with at least one dimension of the TBL (Figure 1). Additionally, goals were further divided into specific targets and deadlines (usually 2020 or 2030), explaining what action and timeframe were needed to reach the overall goal. Through a variety of assigned quantitative indicators, global progress could be accurately monitored over the years.

While all SDGs can be assigned to one of the TBL dimensions, Goal 17 provides the overall framework through which the previous 16 Goals and targets would be realized. Thereby, partnerships and global collaboration would be the essential requirement for tackling climate change on a large scale and succeeding with the ambitious targets.

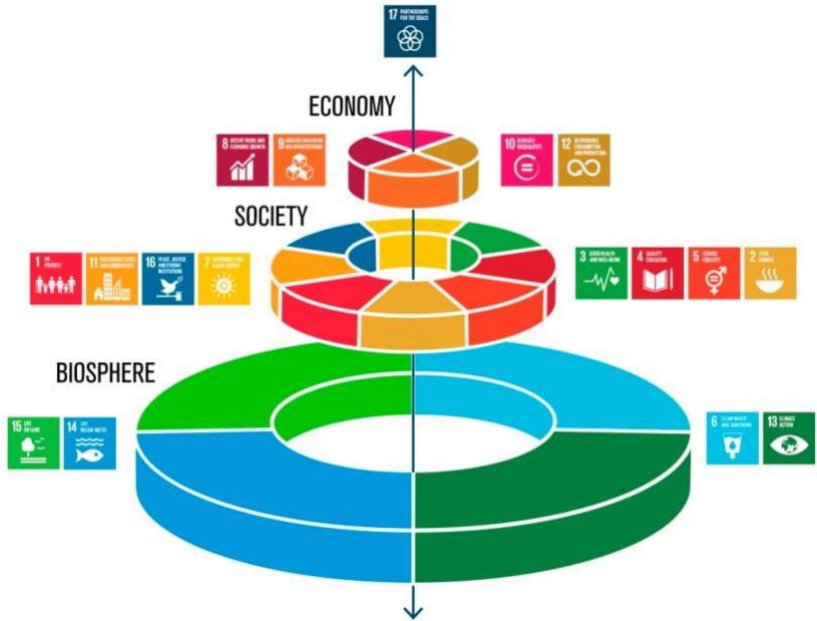


Figure 1: SDG Alignment with the TBL dimensions (Bergman et al. 2018)

Although the SDGs are representing the most global and therefore far-reaching development framework, various regional agendas have been formulated in recent years.

2.3.4. Urban Agenda for the EU

As an example of regional collaboration, the EU has recognized its role in effectively reducing climate change impact on cities by leveraging international partnerships. One notable example is the Urban Agenda for the EU (also known as the Pact of Amsterdam) launched in 2016 to address the increasing urbanization and the growing effect of climate change on cities within the EU (European Commission 2016). The agenda represents a coordinated approach dealing with European and national urban policies and legislation for increasing urban quality of life. As part of the agenda, several priority themes have been defined. In particular, the focus was on Circular Economy, Digital Transition, Air Quality, and Housing, as well as Sustainable Use of Land and Nature-Based Solutions. Thereby, each of the priority themes is aligned with the dimensions of the TBL. Like the SDGs, national and international partnerships represent a key pillar of the EU Urban Agenda, with special emphasis on innovative solutions, such as smart city technology.

2.3.5. European Green Deal

The urban agenda also plays into the later formulated European Green Deal from 2019 (European Commission 2019a). The Green Deal represents the EU's primary growth strategy and aims to transition its economy towards a sustainable model (Figure 2).

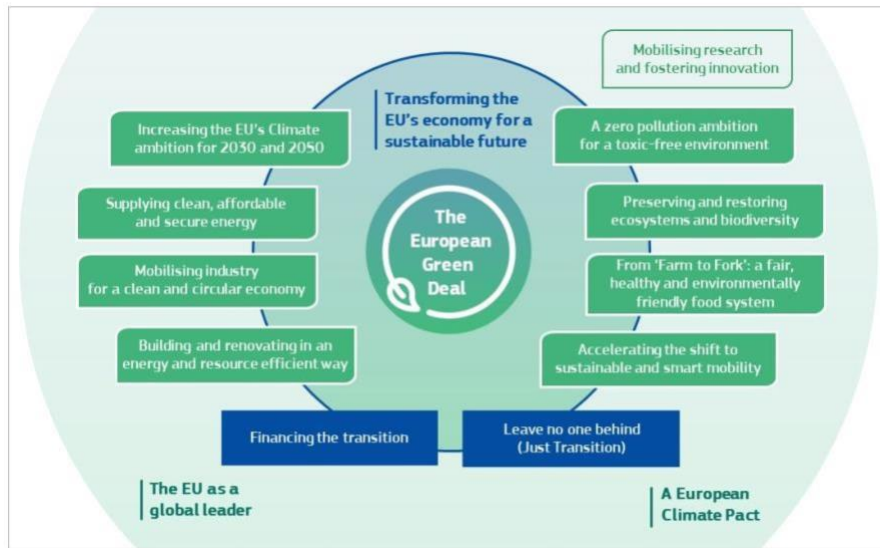


Figure 2: The European Union Green Deal with its goal and main elements

The EU strategy's overarching objective is to make the continent climate-neutral by the mid-century. As a result of the ambitious goal, the EU would see strong environmental benefits, more cost-efficient clean energy, increased use of smart transportation methods, and added new jobs in sustainable industries, resulting in a significantly improved quality of life for all its citizens (Norton Rose Fulbright 2021). The Green Deal consists of several main elements to be addressed, such as climate action, clean energy, and sustainable industry, as well as energy-efficient buildings and renovations, eliminating pollution and preserving biodiversity.

As an example of the ambitious targets of the new strategy, the EU aims to cut greenhouse gas emissions by 55% compared to 1990 levels. Furthermore, as buildings are estimated to cause 40% of the continent's energy consumption and 36% of greenhouse gas emissions from energy production, cleaner buildings are a key requirement. By renovating inefficient buildings and forcing decarbonisation of heating and cooling, energy efficiency will be significantly increased. Lastly, a heavy reduction of pollution for fewer premature deaths, mental and physical diseases

will be enforced until 2050. To achieve that, strong emphasis will lie on pollution elimination measures being part of all future policy developments within the EU. Over time, this will lead to a further decoupling of economic growth and greenhouse gas emissions (European Commission 2019a).

As the EU Green deal represents an international effort with an ambitious goal, a significant amount of funding is required. To finance the individual projects and targets, the EU Green Deal Investment Plan has been created. The plan seeks to allocate a total of €1 trillion, made up of two primary financing streams. The first stream worth €528b is provided directly from the EU budget, with the remaining being sourced from the InvestEU program. The latter program combines funds from the public and private sectors, as well as national co-financing (European Commission 2020b; Norton Rose Fulbright 2021).

One of the various innovation programs funded under the EU Green Deal is the Horizon 2020 initiative, of which Nova SBE received a significant investment for a sustainability project (European Commission 2021; Nova SBE 2020). The EU sees innovation as a key driver in achieving these ambitious challenges. To build innovative new value chains in different markets, both new technologies and new applications of current technologies need to be developed and demonstrated. As financing for adaptation and mitigation action is readily available, innovative solutions are needed to bridge the gap between the two (GERICS 2015).

2.4. Innovation and Value Creation

Innovation is a key driver for solving many modern challenges. Innovation is associated with the commercialization of a new idea or invention. This can be in the form of new products, processes, and services or a combination of them. The innovation does not have to be the result of a single

invention but may also incorporate a variety of already existing knowledge and previous inventions (Grant 2019). Companies are nowadays seeking to innovate in a sustainable way. Therein, they create new products or services with positive net environmental and social impact, without reducing their economic viability (Weidner et al. 2021). By doing this, they are contributing to the TBL and creating value for a range of direct and indirect stakeholders.

The concept of value has been studied extensively over the past centuries and plays a key role in innovation. The famous British economist Adam Smith defined value as a concept that "[...] expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys." (Smith and Channan 1976, p. 48). According to him, the value could be distinguished into value in using an object and value in exchanging that object for other goods or services. This laid the basis for highlighting the subjectivity of value depending on a person's individual preferences and needs. Other scholars, such as Porter, connected value and value creation with a firm's competitiveness. Value is what the buyers (or customers/users) were willing to pay for a product or service. The more use value could be created by a company, the better would be its competitive position in the market. In order to achieve superior value over the competition, the product or service either had to have a lower cost while delivering the same level of quality or provide more benefits to justify the higher price (Porter 1985).

More recently, the term value has been incorporated into a value proposition, which describes a company's bundle of products and services to satisfy its consumer's needs. The more these needs are fulfilled, the more value is created for them. Modern businesses do not purely strive to achieve value for their direct customers, but a variety of stakeholders simultaneously. Amongst others, these can include employees, shareholders, suppliers, partners, governments, or NGOs (Freudenreich et al. 2020).

2.5. Earth Observation Applications

A particularly relevant industry for promoting constant innovation and therefore creating value for many stakeholders is EO (GEO 2017).

EO describes the process of monitoring our planet using remote sensing technologies. This allows for accurate insights into Earth's land, marine (rivers, lakes, and oceans), and atmospheric environment. In the context of satellite-based remote sensing, payloads are mounted on satellites to collect imaging data about a wide range of Earth's characteristics. Collecting, processing, and analysing this data, in turn, allows for the extraction of information relevant to various types of applications and industries. Apart from satellites, other forms of remote sensing can be employed, such as with an in-situ sensor or using drones. However, only satellites can cover wide geographical areas in a short time frame with their imaging sensors (European Commission 2019b). For the scope of this Field Lab report, we will therefore refer to remote sensing done via satellites.

To gain insights about the Earth, satellites carry a range of different instruments as their onboard payload. Thereby, sensors can be divided by two main characteristics: type of sensor and sensor resolution (European Commission 2019b).

There are two main sensor types currently used by remote sensing satellites. Optical or thermal sensors passively monitor the amount of energy reflected off the Earth's surface or atmosphere. By being sensitive to both visible and infrared electromagnetic radiation, they can reveal details otherwise hidden to the human eye or a normal photo-sensor (Figure 3). Radar sensors make up the second type of commonly used satellite payloads. By actively sending out energy towards the Earth and measuring the reflected amount from the surface or atmosphere, they can operate during the night and therefore yield valuable information at all times of day and weather conditions.



Figure 3: Example of satellite imagery for forest fire scar identification. Standard true-colour image (left) vs shortwave infrared (right), revealing extent of fire damage (NASA 2021)

After sensor type, the resolution is the second essential differentiator of remote sensing technology (NASA 2021). Thereby, spatial, and temporal resolution become relevant. Spatial resolution refers to the amount of area that each pixel represents (such as 100m x 100m per pixel, 30m x 30m per pixel, etc.). Finer resolutions allow for increased image details and more in-depth information to be extracted from the data (Figure 4).

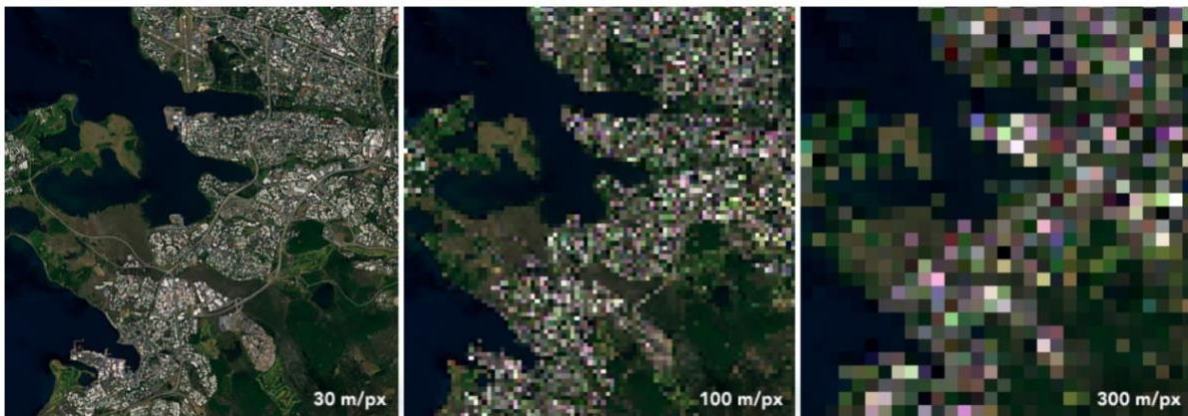


Figure 4: Example of different resolution scales for standard true-colour images (NASA 2021)

Temporal resolution describes the time needed for the satellite to pass over the same exact same location on Earth again. This is dependent on the type of orbit and other technical characteristics, such as width of the area (swath width) that the sensors can capture at a given time.

EO technology can be applied to a variety of undertakings. Examples include the management of energy resources, response to disasters such as floods and earthquakes, as well as defense, and health issues (GEO 2021). Further fields of application can lie in Forestry & Agriculture, Maritime, or Infrastructure (European Commission 2019b).

For example, with the help of EO in the infrastructure area, the progress of large construction projects can be monitored from space and an overall view of the changing urban landscape can be obtained (Preston 2021). Another possible application of EO in the maritime area is the use of oil spill detection. Satellites can be used to monitor larger areas of oil spills at a small fraction of the cost compared to monitoring by aircraft or ship (KSAT 2021). The findings of these space-based technologies provide valid results and are very useful to react quickly to new situations, such as extreme weather events or in times of conflict between nations or groups of people (UN 2015b).

2.5.1. Earth Observation Value Chain

As highlighted in the previous part, EO applications span a wide range of use-cases and industries. Data acquisition through satellites forms the basis for all following activities. These activities are making up the industry's value chain and are required to deliver a final product or service to the end user (European Commission 2017). The value chain can be divided into three main segments and the final users (Figure 5).

The upstream segment consists of companies specialized in the necessary hardware for making spaceflight and satellite operations possible. These naturally include manufacturers and operators of satellites, mission control facilities, and launch service providers. The midstream segment focuses on collecting, processing, and analysing the previously acquired raw data. Therefore, midstream companies are often specialized in IT or software engineering disciplines. Lastly, the

downstream segment uses the processed data to create value-added services for the end-users. These companies are close to the potentially non-tech savvy users and provide consulting services or intuitive applications for the visualization of EO data (European Commission 2019b).

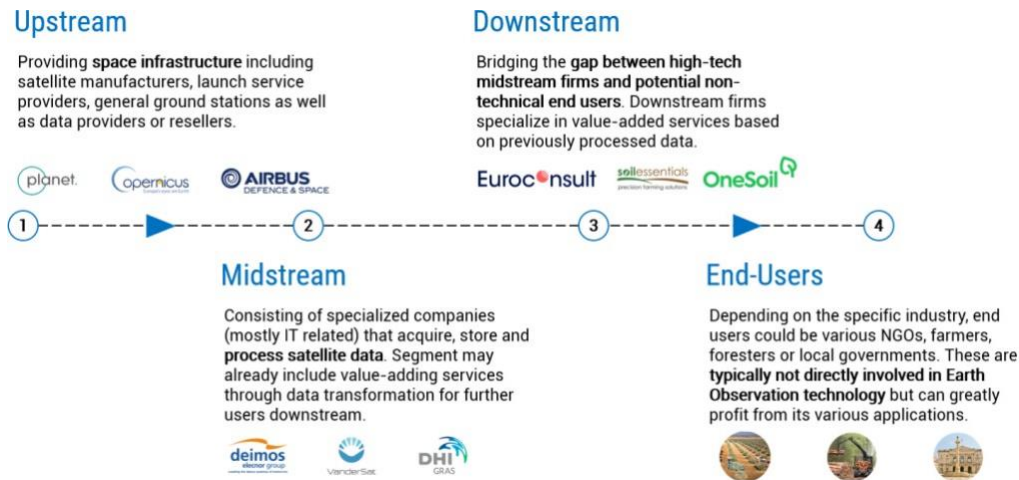


Figure 5: Earth Observation Value Chain, own illustration, adapted from (European Commission 2019b)

2.5.2. Earth Observation Market Size and Notable Players

Overall, EO represents a promising, high-growth industry. A report by the European Commission (2019b) estimated global EO revenues in 2017 at €9.6b to €9.8b, representing an almost 30% increase to 2015. At €7b, most revenues came from the upstream industry, which also noted an about 40% increase compared to the two previous years. The overall industry is predicted to have a CAGR of 8,3 % over the 2021-2026 period. While the Asia-Pacific EO market currently exhibits the highest growth rate, North America remains dominant in terms of market share and is expected to remain a leader for now (Mordor Intelligence 2020). This is mainly attributed to a significant amount of ongoing research studies and investments in the market, as well as the resulting fast and high adoption of commercial satellite imaging for a wide range of industries within the continent (Globe NewsWire 2020).

When looking at the EO value chain, growth fluctuation is primarily expected in the upstream segment due to varying satellite launch demand. As for the downstream market, Europe remains a significant player, capturing about €950m or 33% of the global downstream market share. This market is expected to grow to over €1.3b by 2022, with an annual stable growth rate of 6% (European Commission 2019b; EUSPA 2021).

Regarding the competitive landscape, the European EO market has several major players present, often possessing their own satellites for raw data acquisition. Depending on the type of application, different providers are commonly used. Commercial weather and agriculture data are mainly provided by cloudeo, while infrastructure monitoring information sees e-geos as the main supplier. For commercial urban planning data, both Airbus and Hexagon Geospatial is showing significant market share. The market concentration tends to be rather consolidated than fragmented, however, it remains a highly competitive industry. One important, non-commercial player to mention is the EU's Copernicus Program, which has been providing free-to-use raw satellite data for a wide range of applications since 2014. The European initiative has proven highly successful. In 2018, Copernicus-based value-added products are estimated to have enabled over €300m revenues for Agriculture end-users and over €77m in Forestry. Currently, revenues from Urban Monitoring applications are lagging with only €24m enabled revenues, although forecasted to show a 17% growth rate over the next years (European Commission 2019b).

3. Earth Observation for Urban Planning

3.1. Earth Observation for Mitigating Climate Change Impact on Cities

Urban areas hold an important position in today's globalized and technological world, as they play a vital role in bridging the gap between international development and environmental goals, such as the Paris Agreement and the SDGs (European Commission 2020a). Additionally, growing cities and strengthening effects of climate change are causing increased calls for more ecological and social urban planning (UN 2018). The next part will highlight some important use cases for EO-based solutions for assisting in urban planning activities.

Urban populations are becoming increasingly vulnerable to the effects of climate change. Therefore, various measures have been presented to improve the adaptation of cities. These include the so-called Nature-Based Solution (NBS), as described by Chrysoulakis et al. (2021). Also referred to as natural measures against climate change, they can include the restoration, conservation, and improved management of urban ecosystems with the aim of capturing and removing CO₂ from the local atmosphere and thereby increasing citizen health and well-being (American University 2021). In this context, urban planning and development will play a decisive role by combating climate change and improving the adaptation to new climate challenges. To ensure the monitoring and evaluation of the NBS in the best possible way, satellite-based earth monitoring is used. EO can provide valuable objective data from space, which can assess changing ground conditions, air quality, or consequences of natural disasters (Chrysoulakis et al. 2021). When interpreted by experts, this data can reveal important information and enable more effective urban planning, ensuring overall population safety.

For the main part, severe climate change-related threats to urban regions are mainly due to heat waves from overall rising temperatures and increased flood risks caused by heavy rainfall. Both pose a serious risk to the well-being of citizens. EO provides opportunities for successful monitoring of both the thermal behaviour of cities and the mitigation of flooding in urban areas to protect the local population (Mitraka and Chrysoulakis 2018).

Regarding further potential fields of application, the images provided by the satellites can be used for urban management and planning purposes in specific areas, such as for the analysis of urban sprawl and for general land use mapping (European Commission 2020a). Additionally, it may be employed for the monitoring of green areas (Figure 6), building footprints, and population density, as well as giving insights about the transport infrastructure and highlighting flood and landslide risk (Bartalis 2020).



Figure 6: Urban Green Areas Assessment - (Bartalis 2020)

EO can also have a reporting function. In this way, it can help to review international agreements and conventions from space and ensure objective, unbiased information (European Commission 2020a). With the obtained data, further analysis for a variety of specific topics can be done. As an example, for progress monitoring of global climate objectives, the Japanese Aerospace Exploration

Agency uses EO for the long-term observation of greenhouse gases with the aim of achieving the Paris Agreement and their NDCs (JAXA 2020).

3.2. EO and Urban Planning Contributions to SDGs

As highlighted in the previous part, EO data can be used for various urban applications. Therefore, the related services are directly supporting the monitoring and achievement of key SDGs. The SDG 11, Sustainable Cities and Communities is the primary goal dealing with the development and planning of urban areas. The main aim of this SDG is to enable inclusive human settlements, enhance their overall safety and resilience against threats and steer their transition into a sustainable way. Thereby, the SDG consists of several individual targets (UN 2021b). These include strengthening sustainable urban planning, reducing the number of people affected by disasters, ensuring access to safe green spaces, and limiting the environmental impact of cities in general (BMZ 2021).

As can be seen in Figure 7, various SDGs and targets are supported by EO activities (Gill and Kavvada 2020). Although not specifically mentioning it like in Goal 11, many of the other SDGs and targets are still indirectly linked to urban planning activities and can be assisted by them.

Target Contribute to progress on the Target, not necessarily the Indicator							Goal	Indicator Direct measure or indirect support to the Indicator						
			3.3	3.4	3.9	3.d	3 Good health and well-being	3.9.1						
6.1	6.3	6.4	6.5	6.6	6.a	6.b	6 Clean water and sanitation	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1		
			7.2	7.3	7.a	7.b	7 Affordable and clean energy	7.1.1						
			9.1	9.4	9.5	9.a	9 Industry, innovation and infrastructure	9.1.1	9.4.1					
			13.1	13.2	13.3	13.b	13 Climate action	13.1.1						

Figure 7: Selected SDGs, Targets and Indicators directly and indirectly addressed by EO, adapted from (Gill and Kavvada 2018)

The focus lies especially on SDGs 3, 9, and 13. The SDG 3 promotes well-being and ensures a healthy life with its target 3.9 related to reducing the number of illnesses and death due to environmental pollution such as bad air quality. Solutions from urban planning can significantly contribute to achieving these objectives. With the use of satellite and continuous monitoring, air quality and pollution can be effectively surveilled and addressed. EO also helps further in the development of smarter cities by monitoring urban heat waves and the green areas of a city. This can improve general wellbeing and health issues. Regarding SDG 9, which focuses on building inclusive, resilient, and sustainable infrastructure, EO imagery permits to map areas for better and smarter space use. Some EO solutions help to monitor roads, bridges, or buildings, helping governments and construction companies to make efficient and sustainable decisions. EO can hereby provide data for infrastructure process monitoring and thereby assist with urban planning. Finally, SDG 13 is supporting actions to combat climate change and its consequences in general. Target 13.1 aims to reinforce resilience and adaptivity to natural distress and climate-related hazards. With the use of EO technology, zones revealing high risk can be highlighted to efficiently allocate resources and take better actions.

3.3. Current Challenges

Although EO provides many advantages, there currently are several challenges slowing down its increasing use for urban planning activities. In certain cases, there is a discrepancy between municipalities in terms of technology adoption. While some are eager to use innovative solutions, others represent late adopters. Low cost-efficiency of some existing solutions and local decision-makers not wanting to change their routine procedures in urban planning can worsen this effect. In some cases, local regulations even prohibit satellite monitoring to a certain extent (Prakash et al. 2020; European Commission 2019b). Another challenge is represented by a potential lack of

technological know-how required for the application of EO solutions. Especially in less developed countries, finding qualified personnel for processing and interpreting EO data can be difficult. Additionally, municipal records are also often not updated or available (Prakash et al. 2020; Musakwa and van Niekerk 2015).

The last challenge is more related to the solution providers than the end-users. Compared to other sectors like Agriculture or Forestry, EO companies for urban planning are not that well represented yet. This is also highlighted by the amount of end-user revenues enabled through Copernicus data, which was significantly lower for urban monitoring. Therefore, related EO companies are lacking exposure and the resources for identifying new attractive markets where their solutions would have a strong and lasting impact with regards to the TBL. One tool facilitating the choice of which new market to enter is the Value Creation Wheel (VCW).

4. The Value Creation Wheel

The VCW (Figure 8) is a dynamic meta-framework with the aim of enabling Key Decision Makers (KDMs) to solve complex organizational challenges, and simultaneously create and capture shared value in the process (Lages 2016).

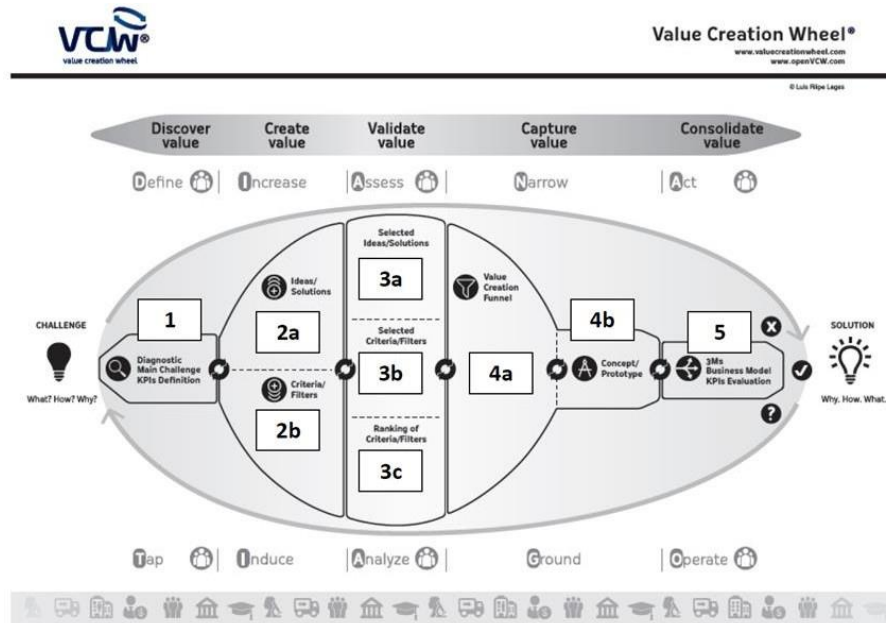


Figure 8: The Value Creation Wheel (VCW) with its main phases & sub-phases (Value Creation Wheel 2020)

4.1. Challenges of Modern Key Decision Makers

A KDM can be described as a unique and powerful person that is able to achieve substantial impact through their actions. KDMs can exist in various contexts and functions, such as CEOs of companies, department directors, entrepreneurs, or even people making important decisions in their everyday lives. The key requirement for becoming a KDM lies in the possession of necessary resources to go through with their decision. Those resources can be summarized as the 3Ms—Manpower, Minute, and Money (Value Creation Wheel 2020), further explained in Phase 5.

However, modern KDMs are facing a variety of challenges. While multiple options to consider for a decision might seem to facilitate the process of making a good choice that they will be happy with, it actually has the opposite effect. An abundance of choice requires significantly more time and effort in evaluating options and can cause a general unsatisfactory feeling related to the final decision. This phenomenon is known as the Paradox of Choice (The Decision Lab 2021).

In a corporate context, the Paradox of Choice can be amplified by several factors, posing an additional challenge to KDMs. First, the overall complexity of the problem faced might increase its successful and thorough understanding. Furthermore, the available teams could show a lack of support or creativity for successfully tackling a challenge. Lastly, the integration of various stakeholder perspectives might be difficult, as it is not clear whom to involve and at what time of the project (Value Creation Wheel 2020). The VCW offers a convenient solution for these problems. By applying the framework, KDMs can make highly informed, relevant, and impactful decisions for a wide range of challenges (Lages et al. 2020). Thereby, the framework follows five main phases.

4.2. Phase 1 – Discover Value

The first phase (1), Discover, helps the team applying the VCW to discover value, characterize the general context and identify main challenges as well as establish KPIs that will be used to measure impact and success during and after the project (Reis-Marques et al. 2019). It is crucial to get a good understanding of the context and environment of the challenge, as this will reveal relevant market characteristics, help gather technological and practical know-how and gain industry-specific insights into the value chain. As a result, the various stakeholders to involve in the project will also become clear (Lages 2016). A variety of supportive, more traditional frameworks can be

used to assist in the initial phase. The PESTEL (Political, Economic, Societal, Technological, Environmental and Legal) analysis (Aguilar 1967) may be used for gaining a macro view of the industry and its influencing factors. Additionally, Porter's Five Forces (Porter 1980) can be employed for insights into a specific industry's attractiveness by revealing competitive forces that influence business performance. For a more internal contextualization, the SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis (Humphrey et al. 1960) can be conducted for better understanding where firms' internal capabilities and disadvantages lie, as well as highlighting external factors that could present opportunities or challenges in the future. Extending on the SWOT analysis, TOWS can help forming actionable tactics, leveraging strengths and opportunities while mitigating the company risks.

4.3. Phase 2 – Create Value

The second phase of the VCW creates value by generating a wide range of potential solutions (2a) and filters (2b) for narrowing down these solutions. To facilitate this process, various methods can be employed, such as brainwriting, brainstorming, conducting literature reviews, surveys, or stakeholder interviews (Reis-Marques et al. 2019). Especially the involvement of internal and external stakeholders is critical for phases 2a and 2b, as multiple points of view and opinions should be considered for higher quality input. It is also key to collect all ideas and not to discard any at this stage. Therefore, the organizational hierarchy should not play a role in the assumed relevance of an idea, and every employee or member should have the same weight in their opinion (Lages 2016).

4.4. Phase 3 – Validate Value and Poker Method

In the third phase, Validate, the previously created value is reviewed. By involving the KDMs, solutions (3a) and filters (3b) are refined by narrowing down to the most relevant ones. The third phase is concluded by establishing a ranking of filters (3c) in accordance with their importance to the KDMs (Lages et al. 2020). In the third phase, KDM involvement becomes critical.

One way to obtain effective feedback in larger groups and therefore refine solutions and filters is the framework-specific POKER method (Lages 2015). It is based on the principle that each received feedback can be grouped into one of four possible categories, which will determine the further necessary process for each solution or filter. Thereby, ideas may either be Kept, Killed, Reviewed, or Multiplied, in accordance with the feedback.

4.5. Phase 4 – Capture Value and Value Creation Funnel

The fourth phase of the VCW, Capture, aims to capture the previously created value by applying the generated, validated, and ranked filters to the solutions (4a) using the Multi-Criteria Decision Analysis (MCDA) and Value Creation Funnel (VCF). Subsequently, a concept or prototype of the final solution(s) must be prepared, allowing for identifying the ideas with the highest potential (Lages 2016). As mentioned previously, the VCF (Figure 9) is of key importance for the fourth phase, as it allows for a structured, logical, and unbiased approach for narrowing down solutions.

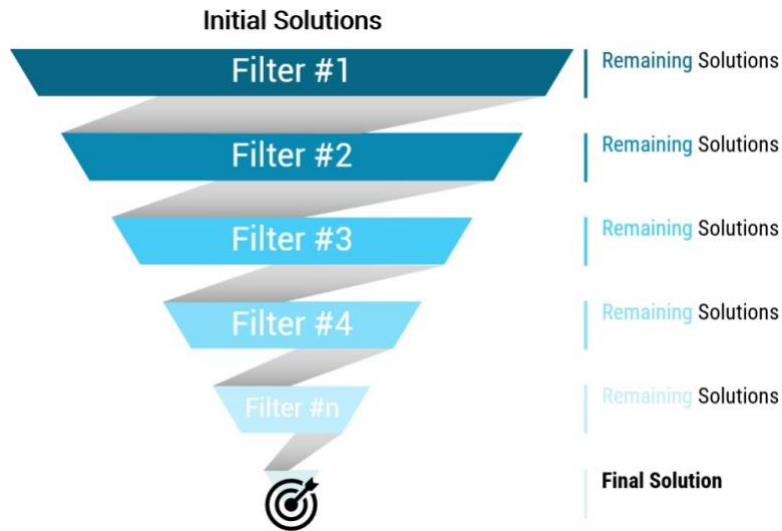


Figure 9: Visual Representation of the Value Creation Funnel (VCF), adapted from (Fonseca et al. 2018)

Establishing filter threshold (cut-off) values and applying them to all the solutions will gradually eliminate solutions until ideally, only one remains (Lages et al. 2018). In some specific cases, such as when finding the most attractive geographical market for a product or service, after the development of a global VCF at the country level, a second local VCF might be needed at the regional level to achieve more substantial results (Fonseca et al. 2018).

4.6. Phase 5 – Consolidate Value

The fifth and final stage, Consolidate, allows the project to develop an action plan for the initially launched challenge. As an example, this could take the form of a business model or a go-to-market strategy. To estimate the required resources for their implementation, the 3Ms analysis can be conducted. Thereby, Manpower refers to the number of required employees and their respective expertise and abilities. Assigning the right employee to the correct task translates into efficiency and productivity. Minute describes the time allocation for the implementation of the final solution. This could be in the form of a timeline to chronologically organize and prioritize tasks and actions.

Lastly, Money refers to the monetary resources required for successfully going through with the decision. In the case of a market entry, this could include the marketing budget, local registration fees, and additional salaries for potential staff expansion.

At the very end of the VCW project, the solution and its implementation plan are presented to the KDMs. As they possess the required resources, they can review the work and give final approval. Depending on their judgement, they might conclude on a Go, No-Go, or Check decision for the project. As the VCW is a dynamic and non-linear framework, in the case of a No-Go decision, the team is always able to go back to previous phases to revise them (Lages 2016).

5. Conclusion

This Field Lab (FL) aimed at applying the Value Creation Wheel (VCW) for identifying attractive, new geographical markets to increase the impact of Earth Observation (EO) on urban planning. Based on the FL's presented research, global cities are experiencing significant economic losses due to climate change. Rapid urbanization causes increasing concerns for maintaining an adequate quality of life for the citizens, such as health, quality of infrastructure, and safety. Modern urban planning requires addressing all these challenges. It was found that most cities lack effective methods for monitoring the urban environment and making informed and impactful decisions.

International efforts such as the SDGs, EU Green Deal and the Urban Agenda share the common goal of making the world a better place by steering it into a sustainable direction. To achieve that, all intended targets and measures must support the pillars of the Triple Bottom Line (TBL). With significant financial resources made available to achieve these goals, innovative solutions are needed to close the gap between the two. Therein, truly sustainable innovation creates value for all TBL dimensions at once. This includes financial profit for the organization and customers themselves, but also a positive impact on communities and the environment.

The EO industry represents a source of constant technological and sustainable innovation through enabling meaningful decisions benefiting many stakeholders at once. While EO is commonly used in the Agriculture, Forestry, or infrastructure sector, its application in urban planning is currently not that pronounced.

To increase its contribution, three promising solutions from two different service providers were chosen by the FL team. These included Urban Heat Island and Building Health monitoring by

Latitudo 40 and Impervious Surface monitoring by DHI Gras. All added to the TBL dimensions and were strongly aligned with multiple SDGs and their related targets.

Together with the companies' Key Decision Makers (KDMs), the challenge of identifying new attractive geographical markets was launched. After applying the VCW and its five main phases, the projects were presented to the KDMs. All three received highly positive feedback, with the companies being convinced their service would strongly benefit the proposed city and regions.

The framework enabled the FL team to solve a complex challenge in a high-tech market. Close collaboration with KDMs as well as involvement of other internal and external stakeholders allowed the incorporation of various perspectives and therefore create additional value in the process. The understanding of environmental and social factors that would highlight the potential need for the solution in a particular geographic area was key to achieve a bigger impact. The use of quantitative datasets enabled a structured and unbiased process for identifying the final target markets.

As a result of the individual projects, Petah Tikva subdistrict of Israel, Amsterdam city in the Netherlands, and Kanagawa prefecture in Japan were found to have the highest need for the chosen urban planning solutions. Therefore, entering these geographical markets would have a lasting positive impact on regional urban planning activities and the overall quality of life of citizens. While it remains to be seen what new, innovative solutions our companies will develop for other markets, space-based methods will play an ever-increasing role in the future of urban planning.

A Work Project, presented as part of the requirements for the Award of a Master's degree in
Management from the Nova School of Business and Economics.

Application of the Value Creation Wheel to increase the impact of Earth Observation on Urban Planning

VCW 2 - Identifying the Most Attractive Geographical Market for the Building's Monitoring Solution by
Latitudo 40

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Work project carried out under the supervision of:

Prof. Luis Filipe Lages

Abstract:

With the increase of the urban population accommodation' types and infrastructures are changing. Climate change is also impacting infrastructures, with an increase in natural hazards, bridges, roads, or buildings damages also increase which can be dangerous for the population. Latitudo 40 is a company offering urban planning solutions to improve life quality with the use of Earth Observation (EO). Its building monitoring service permits monitoring cities to help governments and engineering companies make smarter decisions. Collaboration with Latitudo 40 and the application of VCW has permitted to highlight the Netherlands and Amsterdam as an attractive geographical market for this service.

Keywords: Innovation, Value Creation, Urban Planning, Earth Observation, Technological Markets

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

VCW 2: Identifying the most attractive geographical market for the Building Health monitoring solution by

Latitudo 40.

PHASE 1: DISCOVER VALUE

This individual part of the project consists in applying the VCW to a different service from the Latitudo 40 portfolio, the Building Health monitoring solution.

1.1 INTERNAL & EXTERNAL ANALYSIS

The internal and external analysis of the company highlights the growing EO sector and the potential of Latitudo 40 to amplify its market share. The wide range of services and their strong contribution to SDGs will help the company achieve this goal (Appendix – Figure 1 & Figure 2). This study features how Latitudo 40 can stay competitive by increasing its awareness in the market and developing its international presence. Hence this analysis points out the emerging competition and growing demand within the sector (Figure 3 & 4).

1.2 CONTEXT AND BACKGROUND

In accordance with the United Nations (2018), 68% of the population will live in urban areas by 2050. Urbanization leads to a change in accommodation type, with twice as many people living in apartments rather than houses (Euromonitor, 2014). Consequently, infrastructures need to adapt and require the development of smarter cities to accommodate the growing population. The market for smart city platforms and ESG (Environmental, Social and Governance) solutions is forecasted to have a CAGR of 9.3% from \$96 billion to \$181 billion with more than 300 000 cities in the world and around 50 000 oriented to smart geospatial solutions and ESG (Latitudo 40, 2021). One could think that technological development and architectural progress diminishes buildings' crumble risks, especially in developed countries.

However, the problem persists, due to the worldwide presence of old and risky infrastructures. For example, in June 2021, a building collapse killed 98 people in Florida (USA) (The Guardian, 2021). According to Latitudo40 engineers, a building collapse might happen without natural disasters due to overloading parts of the structure and poor maintenance. Other aspects such as weak foundations, natural hazards, questionable

materials, or ground conditions may also impact buildings resistance. Buildings’ strengths and capacities decrease over time, about 8 collapses happen every year around the globe causing around 340 deaths (Disaster Doc, 2020). These numbers are expected to increase as climate change brings more natural disasters and sea-level rise impacts ground conditions.

1.3 BUILDINGS MONITORING SERVICE

a. Service introduction

To create cities that respect the principles of sustainability, resilience, and inclusiveness, infrastructures need to be monitored and restored. Through satellite technologies, Latitudo 40 creates maps providing various information on urban areas and infrastructures such as displacement risks, run-off, and ground quality. The company works at a city level with the building health monitoring service, which is based on historical data from 2016 and continuous surveillance thanks to the use of Copernicus Sentinel 2 data. The satellite’s imageries are acquired every 2 or 3 days over the world permitting continuous monitoring. Copernicus is also supplying high-resolution (10x10m) images between 3m and 50cm. Information from space is mixed with ground sensor information (when available) and applied to their algorithm and machine learning (ML). The final aim is to analyze and monitor urban evolution overtime to help make decisions. The information is then presented on Latitudo 40’ platform in an intuitive way. With login credentials, customers have 3 months of free access and can connect to the dashboard directly from their computer without installing any software. The price of the service is adapted to the type of information provided, it is around €3,000 and €4,000 per month. The data acquisition, processing, and visualization are completely automated. The analysis is 50 times faster than other algorithms and traditional collection and evaluation of data are 90% more expensive.

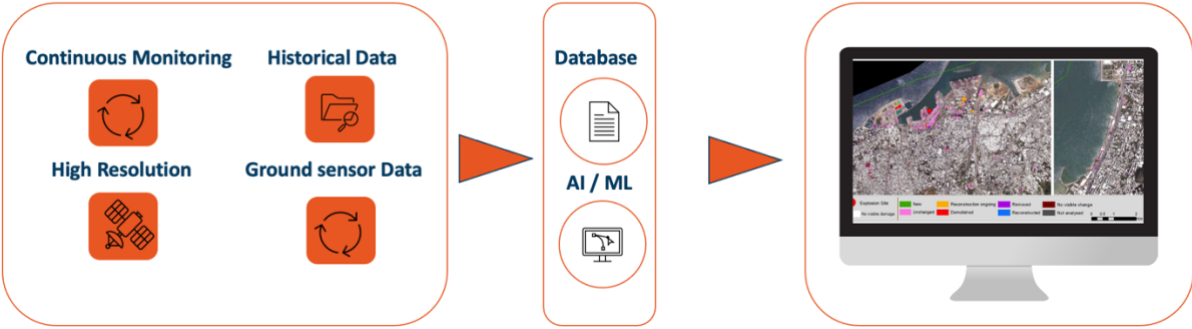


Illustration 1: Buildings Health Monitoring 3 steps process.

b. Service contribution

The service is contributing to some SDG such as number 9 about the industry, innovation, and infrastructure, and more precisely the target 9.1 to develop quality, reliable, sustainable, and resilient living places for humans' well-being. Monitoring cities' buildings decrease the risk of collapse, prioritizes renovations, increases populations' safety, and decreases housing and safety inequalities. The SDG 11 for sustainable cities and communities is the biggest contribution of Latitudo 40 with this solution. It helps target 11.1 to develop safe housing and upgrade slums by prioritizing riskier buildings. The target 11.5 with the aim to reduce the number of death due to bad infrastructure is supported as well (United Nations, 2021).

c. Potential market and customer

Since Latitudo 40 is working at a city level, every city might need this service, although the ones prone to natural disasters or to an increase of its urban population are considered as priorities. Cities from developed countries might also be more willing to pay for this service. Regarding potential customers, in some cities such as Milan, Turin, and Barcelona, Latitudo 40 is working directly with the city council. In other locations such as Berlin, Florence, or Helsinki, the company is working with private firms from the construction and civil engineering sector.

1.4 COMPETITORS ANALYSIS

A competition analysis is essential to understand the market and the service's strengths and weaknesses. The KDMs provided a list of 14 companies competing with their activities. 15 additional companies from individual research have been analyzed to find firms directly rivaling the building's health monitoring offer. (Appendix – Table 1).

- The first competitor is SkyGeo with its service providing monitoring for civil engineering projects. From the site selection to the development and maintenance, SkyGeo is furnishing a complete surveillance solution with historical data since 1992, it is offering consulting and forecasting products.

- The second service competing is the infrastructure product by Up42. Satellite imagery mixed with weather data and machine learning allows to monitor changes of urban areas over time. It is available on a platform working with credits such as Latitudo 40.
- The third company supplying a similar product is EOS a large American company and a menacing competitor on the EO market. It is offering a structure surveillance and consulting services to help companies during their constructions/renovations.
- The fourth is Sensor, a Dutch company. The business is similar to the Latitudo 40 portfolio with fewer products. The civil infrastructure solution provides monitoring analysis of ground deformation risks with satellites.
- GEOALERT is the last direct competitor. Its development and construction service is working at a city level thanks to EO imagery and historical data. It provides a monitor of urban areas changes.

Although competition is still weak, it is expected an increase in this growing market.

1.5 CHALLENGE, KDMs, Stakeholders and KPIs

As mentioned in the common part, the objective is to find a new **geographical market** to implement the building monitoring solution.

b. Key Decision Makers

The Key Decision Makers of the project are Latitudo 40's CEO and founder Mr. Gaetano Volpe, and Mr. Mauro Manente, the co-founder and chief technical officer. They play an important role in the project, their knowledge about the market and the service was precious to understand the service and define filters to achieve the project's challenge.

b. Stakeholders

Professor Lages, Nova SBE supervisor and the creator of the VCW (Lages 2016; Lages et al. 2020), supported the good development of the project. Founders and experts from rivaling companies were also involved for a better understanding of the market. Finally, VCW Field Lab team members' feedbacks were precious to ensure the smooth running of the project (Appendix – Table 2).

c. Key Performance Indicators

To successfully respond to the challenge, short, medium, and long-term KPIs have been set with stakeholders' help. They were split into project management-related and company development-related KPIs. Short-term objectives were mainly related to achieving VCW phases on time and developing a routine to accustom KDMs to regular meetings as their feedbacks are essential in the VCW process. Regarding medium-term KPIs related to company development, there was the finding of a promising geographical market and the building of a stable competitive position. This is imputing long-term objectives such as the expansion to other cities from the new country and team development (Appendix – Figure 5).

PHASE 2: CREATE VALUE

2.1 INDUCE SOLUTIONS

Since the challenge is to find a new geographical market for the building monitoring service, the 193 UN member states were initially chosen as potential markets.

2.2 INDUCE FILTERS

The generation of a wide range of filters is the best way to end up with a reliable solution. Overall, a total of 53 filters has been induced through different research methods (Appendix – Figure 6).

Individual research on the service and its implications has generated criteria that helped to assess countries with a need for building monitoring services. It has led to the generation of 10 filters such as the seismic risk, percentage of population growth, or infrastructure fragilities. Discussions with internal and external stakeholders helped for a better understanding of the service's functioning and objectives. The brainstorming provided 10 different options, the climate risk index and English level came out as essential aspects to select the appropriate market. The brainwriting method generated most filters. The field lab team used the 6-3-5 method which is usually working this way: 6 people must write 3 ideas in 5 minutes. With only 3 working on this project, the method was 3 people generating 6 ideas in 5 minutes. The brainwriting session generated 54 criteria and 36 different ones, such as infrastructure index, country risk, or the number of buildings with more than 10 floors.

PHASE 3: VALIDATE VALUE

3.1 SELECTED SOLUTIONS

It has been decided that filters should be applied to the 193 UN countries considered as potential targets.

3.2 SELECTED FILTERS

The poker method is used to identify the most relevant filters. The multiply category is composed of 2 filters for whose data could not be found but the idea is important for the next phases. All the repeating ones were automatically killed (25). The others were killed because of the incapacity to measure them or because of a lack of information. The result is 11 filters. The KDM Mr. Manente was involved to validate the selection and ranking.

3.3 FILTERS RANKING

Rank 1 - GDP per capita: A high GDP per capita is a sign of a developed and industrialized economy that could be willing to pay for EO service (World Bank, 2020a).

Rank 2 – Climate Risk Index: This index highlights countries' exposure to extreme weather events (Greenwatch, 2019). The higher the climate risk is, the higher the government/companies will need the building monitoring service for safer infrastructures.

Rank 3 – Infrastructure Index: A high infrastructure index tell that government is willing to invest in this field. (World Economic Forum, 2018).

Rank 4 – Percentage of Urban Population: A large amount of the population living in urban areas implies that government needs to develop infrastructures for the population's comfort and safety (World Bank, 2020b).

Rank 5 – Population Density: The denser a population is, the more the government will invest in services related to its infrastructures. (World Bank, 2020c).

Rank 6 - Elevation Below 5 meters: A large percentage of the population living in area with an elevation below 5 meters implies that the government will have to work on its infrastructures to fight against sea level rises. (World Bank, 2020d).

Rank 7 – Political Risk Index: The political risk index is an important factor for long-term partnerships, the more stable a country is, the more stable business relationship will be. (World Bank, 2020e).

Rank 8 – English Level Index: The higher the English level of the country is, the easier it will be to enter the country and develop partnerships with local companies (EF EPI, 2020).

Rank 9 – Percentage of Population living in a city with more than 1 million inhabitants: The higher the percentage of the population living in a big city is, the higher the government needs to invest in infrastructures (World Bank, 2020f).

Rank 10 – Percentage of Population living in Slums: A large amount of a population living in critical conditions may encourage the government to develop an investment plan to improve living conditions thanks to urban planning services. (World Bank, 2018).

Rank 11 – Ease of Doing Business: This indicator is assessing different parameters which are impacting the easiness of doing business with a country (World Bank, 2020g).

PHASE 4: CAPTURE VALUE

4.1. MCDA & VCF APPLICATION

The MCDA and VCF are used to find the best suitable market to develop the buildings' monitoring service. For the MCDA a “1” is attributed to the values above the threshold and “0” to the ones below. (Appendix – Table 3) The VCF is similar to the MCDA but “1” is only attributed if a “1” was received for the last filter, otherwise, the value is “-x- “. This analysis highlights a funnel (Appendix – Figure 4).

4.2 MCDA & VCF SOLUTIONS

For both MCDA and VCF, the **Netherlands** came in the first position. The country is facing emergencies to renovate and fix its infrastructures.

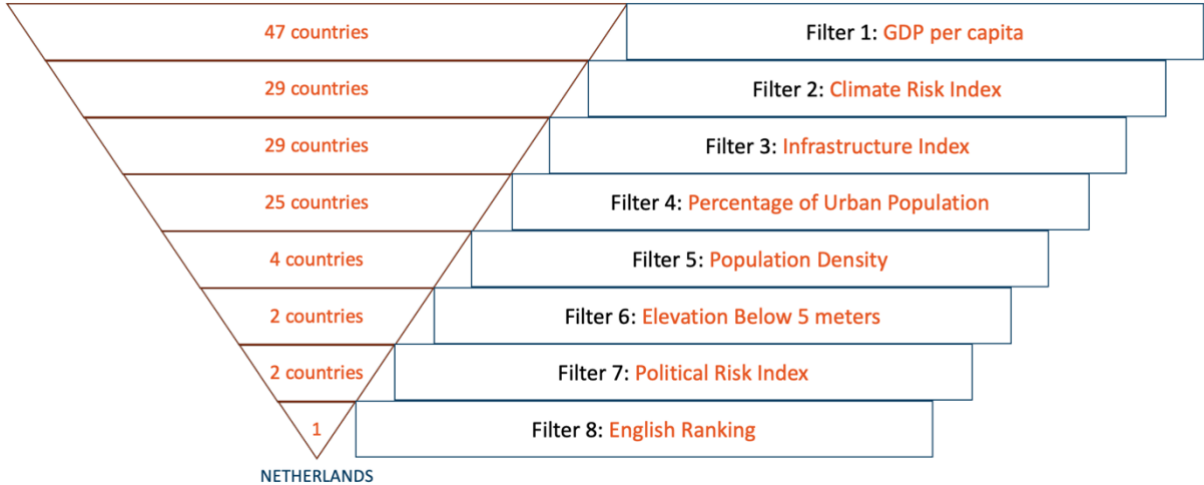


Illustration 2: Country Funnel Leading to the Netherlands.

In agreement with the Netherlands Environmental Assessment Agency report from 2016, the cost of infrastructure and subsidence will be €5.2 billion by 2050. Furthermore, 60% of the country is prone to river flooding and scale coastal (Climate adapt, 2021).

After consulting the KDM it has been decided to look for potential customers. Locations of the largest construction and civil engineering companies operating in the Netherlands have been checked. This process has unveiled Amsterdam as the most promising market because it is the city with the most companies' headquarters (Appendix – Table 5). All the greatest company's headquarters are in Amsterdam since it is the capital and the most densely populated area of the country with around 863 thousand inhabitants which imputes infrastructures development (Statista, 2019). Amsterdam has been built in the twelve' century. Infrastructures are mostly based on piles and official renovations only started in 2019. When renovations have been considered, the Amsterdam town council has worked with SkyGeo to use satellite data to monitor and renovate bridges. It came out that 5% of the 200km of walls have a risk of collapse, six bridges have been closed and the maintenance should cost around €22.5 million per year (Eurisy, 2021). Amsterdam is an ideal location for Latitudo 40 because it has started to use monitoring services for its renovation, it is open to the world, and it has an important climate change and sea-level rise threat. Furthermore, according to KDM Mr. Manente, Amsterdam is a promising market, even if it is the largest city in the Netherlands, Latitudo 40 is used to work in big cities, such as Barcelona, or Zhuhai in China.

4.2.1 POTENTIAL CUSTOMERS IN AMSTERDAM

The 3 most interesting potential customers for Latitudo 40 in Amsterdam are the Amsterdam Smart City project, TPEX, a company focusing on smart buildings construction and monitoring, and Arcadis, a consulting/construction company. Find the complete list of potential customers in the appendix, Figure 7.

Entering the market with a partnership with the Amsterdam Smart City platform is a chance to quickly develop the company awareness and to get known by the government as Amsterdam City is supporting the project. The platform's aim is to support Amsterdam's smarter development by creating partnerships and projects with private companies. It is a solid and sustainable way to enter the market. The second potential customer is TPEX. This company based in Amsterdam is focusing on smart buildings construction. Through

artificial intelligence (AI) and video surveillance, they provide monitoring services. Latitudo 40 buildings health monitoring could help the company not only for its surveillance process but also for its site's selection. Finally, Arcadis would be an interesting customer as it could use Latitudo 40's service to develop its engineering consulting services. As a big company with \$3.9 billion revenue in 2019, the company could use the buildings monitoring service to develop its activities. KDM feedbacks feature Amsterdam Smart City and TPEX as the two most promising customers.

4.2.2 COMPETITORS IN AMSTERDAM

Seven competitors offering buildings monitoring services have been found. Only 2 of them are direct ones using similar technologies and providing similar quality: SkyGeo and Sensor (Appendix – Table 6). Sensor is a small company with only 10 employees using satellite technology to assess risky buildings and create cities maps for large and small cities. Sensor is not only proposing a similar service but is also similar in its way of functioning with its intuitive platform and consulting services. SkyGeo, a small company with 54 employees who worked for Amsterdam town hall for their bridge monitoring is a significant competitor. Its civil engineering service is offering solutions for monitoring the development and maintenance of sites. However, SkyGeo is working on large infrastructures, and even if the company has already worked at a city level, there is no evidence that they could quickly adapt their service proposition to the market need.

4.3 SERVICE ADAPTATION TO THE MARKET

To successfully enter Amsterdam, it is important to adapt the service to the market needs, particularly to its geographical situation. Sea-level elevation needs to be monitored to rank districts prone to floods. This can help the government and the companies to prioritize their renovations and choose construction sites. It is an efficient way to differentiate from the competition and to develop company awareness. Adapting the service to the type of construction is another interesting solution: Amsterdam has been built on piles which explain habitations' inclination, analyzing piles resistance and load would be an added value to differentiate the service. One of Latitudo 40 competitors, GEODAQ, is supplying this service through surveillance modules, the company can develop a partnership or learn from this existing service to incorporate it. With this service adaptation, Latitudo 40 will follow a **Blue Ocean Strategy** by offering a different product while staying cost-

efficient due to an automated process and the use of free satellite images. The competition in Amsterdam is still low for this specific service despite a pressing need.

4.4 VALUE CURVE

The value curve is used to identify Latitudo 40 strength to enter the Amsterdam market (Appendix – Figure 8). The company will step into the city as a challenger for the two competitors already established. Because Sensor and SkyGeo are using EO technology and an intuitive platform to distribute the service, they are highly similar to the Latitudo 40 way of functioning and strategy. The most important differentiation point is Latitudo 40's cost efficiency because of the fully automated process and free satellite imagery, and its service adaptation to the market needs. Latitudo 40 can enter Amsterdam with success and develop a solid relationship with customers.

PHASE 5: CONSOLIDATE VALUE

5.1 BUSINESS MODEL

As part of the business model development, the 7P's of the marketing mix are considered (Appendix – Figure 9). The product will be adapted to the market. For the promotion, online marketing will be prioritized, the website will be used as the main distribution channel, for this reason, it must be clear and complete: tutorials, service demonstrations and customers testimony must be accessible. The pricing strategy will remain the same, the three months free reinforce competitiveness. The location will be Amsterdam to be close to the potential customers. For the processes, Latitudo 40 will continue to provide excellent customer service with important availability. Finally, concerning people, the company is comprised of ten people including four space industry experts, AI professionals, image processing experts, and business development professionals that can intervene at any moment. Canva Business Model Canva is developed in figure 10 (Appendix).

5.2 3Ms – MEN, MINUTE & MONEY

To successfully enter the market, the right timing, budget, and people are needed, KDMs have been highly involved in this part. Regarding the manpower, the main KDM of this project, Mr. Mauro Manente will oversee the go-to-market strategy. The marketing team, made of 4 employees will work on the website design and content with case studies, and videos to introduce the service and the company. They will also work on

advertising. One additional local sales force will be hired for reaching out to local partners and customers. A timeline has been created for the implementation. The first step of the process will be to send the VCW report to support Latitudo 40 business development team in their further research. The next steps are related to budget allocation and the first marketing activities that will be followed by the first contact with potential customers (Appendix – Figure 11). Finally, the service development cost is forecasted to €25,000/month. The company considers hiring an employee for sales which will cost around 5,000/month in Amsterdam (Glassdoor, 2021). The advertising costs will be around 10,000€ per month and the search engine optimization cost also around €10,000/month. Advertising and SEO costs are provided by KDMs.

5.3 KPIs EVOLUTION

After all the phases of the project completed, it is time to look back to the previously defined KPIs and see to what extent they have been achieved. Most of the medium-term objectives have been completed such as the strong implication of KDM during the process, the finding of a new promising market, or the presence of at least three potential customers. These indicators have supported each-other accomplishments: the strong implication of KDM and stakeholders in the process has permitted the selection of the most interesting area. The only medium-term KPI still in progress is related to company development, it is to build a competitive and stable position in the targeted city. To do so, the technological service needs to be adapted to the new city and these functionalities are not available yet. With reference to the long-term goals, they are not fulfilled until now as the company still needs to further research and adapt their team and service. The objective of the VCW is to provide a solid a sustainable solution for the future with good services and strong customer relationships. At the time of writing, Latitudo 40 has not started its implementation. Team development with 1 employee dedicated to the building health monitoring service has not been achieved thus far such as the establishment of a solid partnership in Amsterdam (Appendix – Figure 12).

6. CONCLUSION & NEXT STEPS

6.1 CONCLUSION

The VCW framework has been applied to Latitudo 40 buildings' health monitoring service to identify the most attractive market. This dynamic process and internal and external stakeholders' strong involvement in

the project have identified the Netherlands and Amsterdam as the most promising city for the buildings' health monitoring services. For this new market, many analyses have been run to find potential customers and for a better understanding of the city's needs.

6.2 NEXT STEPS AND REQUIRED PARTNERS

The KDMs have been very satisfied after the last presentation of the project. Both CTO and CEO especially appreciated the VCF and its potential to decrease the number of potential markets to identify the most interesting one. Even if both agreed that Amsterdam is an interesting city, they have decided on a review of the VCW. The budget for 2022 has already been allocated which obliges to postpone the project. Investors are based in Europe and may increase the budget for this expansion as Amsterdam is a European city and a promising market, but Latitudo 40 team wants to make further research with their own development team first. After this step of research, in February 2022, Latitudo 40 will allocate the budget and make the first contact with potential partners.

Various partners can facilitate the entrance of the company. First, an association with a marketing agency could be a strength for a fast awareness development for Latitudo 40 while pointing out the agency's support to a sustainable solution. The Ask Phill marketing agency is in Amsterdam and has already worked with companies such as Unilever, Polaroid, or Uber Eats. It would be a great opportunity for the firm to develop a partnership with this company. Second, cooperation with a sustainable consulting company can facilitate market entrance and bring new customers to Latitudo 40. The Rock Group based in Amsterdam is a consulting group helping other companies during their transition to greener and more sustainable activities. The services provided by Latitudo 40 could help customers of the group to accomplish their objective in a more efficient way. Finally, joining an NGO such as Milieudéfense is a good strategy to show the company's implication in the field which will impact its credibility. This NGO is driving many projects with the aim to urge governments and companies to make better choices. The KDMs consider that these 3 types of partnerships could considerably facilitate Latitudo 40 implementation and lead to a collaboration with the Amsterdam city council. The presentation ended with acknowledgment and congratulations for the work and planning of a future meeting to further explain the findings and present other potential markets highlighted by the MCDA

and VCF analysis.

Publication bibliography (Common part)

- Aguilar, F. J. (1967): *Scanning the Business Environment*. New York: MacMillan Co.
- American University (2021): Fact Sheet: Nature-Based Solutions to Climate Change. Available online at <https://www.american.edu/sis/centers/carbon-removal/fact-sheet-nature-based-solutions-to-climate-change.cfm>, checked on 12/13/2021.
- Bartalis, Zoltan (2020): Satellite Earth Observation and Urban Planning. Space for Twin Cities Urban Planning, Online Seminar, 26 November 2020. European Space Agency. Available online at https://down2earth.esa.int/wp-content/uploads/2020/12/Satellite-Earth-Observation-and-urban-planning_Bartalis.pdf, checked on 12/13/2021.
- Bergman, Zinette; Bergman, Manfred; Fernandes, Kiran; Grossrieder, Daphne; Schneider, Lea (2018): The Contribution of UNESCO Chairs toward Achieving the UN Sustainable Development Goals. In *Sustainability* 10 (12), p. 4471. DOI: 10.3390/su10124471.
- Blanco, Hilda; Alberti, Marina; Forsyth, Ann; Krizek, Kevin J.; Rodríguez, Daniel A.; Talen, Emily; Ellis, Cliff (2009): Hot, congested, crowded and diverse: Emerging research agendas in planning. In *Progress in Planning* 71 (4), pp. 153–205. DOI: 10.1016/j.progress.2009.03.001.
- BMZ (2021): SDG 11: Nachhaltige Städte und Gemeinden. Available online at <https://www.bmz.de/de/agenda-2030/sdg-11>, checked on 12/13/2021.
- bpb (2021): COP 26: UN-Klimakonferenz in Glasgow | bpb. In *Bundeszentrale für politische Bildung*, 11/16/2021. Available online at <https://www.bpb.de/politik/hintergrund-aktuell/342741/cop-26-un-klimakonferenz-in-glasgow>, checked on 12/14/2021.
- Chrysoulakis, Nektarios; Somarakis, Giorgos; Stagakis, Stavros; Mitraka, Zina; Wong, Man-Sing; Ho, Hung-Chak (2021): Monitoring and Evaluating Nature-Based Solutions Implementation in Urban Areas by Means of Earth Observation. In *Remote Sensing* 13 (8), p. 1503. DOI: 10.3390/rs13081503.
- D’Amico, Gaspare; L’Abbate, Pasqua; Liao, Wenjie; Yigitcanlar, Tan; Ioppolo, Giuseppe (2020): Understanding Sensor Cities: Insights from Technology Giant Company Driven Smart Urbanism Practices. In *Sensors (Basel, Switzerland)* 20 (16). DOI: 10.3390/s20164391.
- EARSC (2020): Industry Facts & Figures - EARSC. Available online at <https://earsc.org/industry-facts-figures/>, checked on 12/14/2021.
- Elkington, John (2004): Enter the Triple Bottom Line, pp. 1–16. Available online at <https://www.johnelkington.com/archive/TBL-elkington-chapter.pdf>, checked on 10/24/2021.
- Erickson, Amanda (2012): A Brief History of the Birth of Urban Planning. In Bloomberg, 8/24/2012. Available online at <https://www.bloomberg.com/news/articles/2012-08-24/a-brief-history-of-the-birth-of-urban-planning>, checked on 12/16/2021.

- European Commission (2016): Establishing the Urban Agenda for the EU. Pact of Amsterdam. Available online at https://ec.europa.eu/regional_policy/sources/policy/themes/urban-development/agenda/pact-of-amsterdam.pdf.
- European Commission (2017): Big Data in Earth Observation. Digital Transformation Monitor. Available online at <https://ati.ec.europa.eu/sites/default/files/2020-06/Big%20Data%20in%20Earth%20Observation%20%28v1%29.pdf>, checked on 12/14/2021.
- European Commission (2019a): Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social committee and the Committee of the Regions. The European Green Deal. COM(2019) 640 final. Brussels, Belgium. Available online at <https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6924a1-H.pdf>, checked on 11/7/2021.
- European Commission (2019b): Copernicus market report: February 2019. Issue 2: Publications Office.
- European Commission (2020a): Opportunities for Open Earth Observations for Sustainable Urban Development | Smart Cities Marketplace. Available online at <https://smart-cities-marketplace.ec.europa.eu/news-and-events/news/2020/opportunities-open-earth-observations-sustainable-urban-development>, checked on 12/13/2021.
- European Commission (2020b): The European Green Deal Investment Plan and JTM explained. Available online at https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_24, checked on 11/7/2021.
- European Commission (2021): Horizon 2020 European Green Deal call: results and ambitions for the future. Available online at https://ec.europa.eu/info/events/horizon-2020-european-green-deal-call-results-and-ambitions-future-2021-oct-27_en, checked on 12/13/2021.
- EUSPA (2021): Earth Observation Market. Available online at <https://www.euspa.europa.eu/european-space/euspace-market/earth-observation-market>, checked on 12/14/2021.
- Fonseca, Vania; Lages, Luis Filipe; Kim, Phillip H. (2018): Deimos: Expanding to a New Market Using the Value Creation Wheel. Available online at <https://store.hbr.org/product/deimos-expanding-to-a-new-market-using-the-value-creation-wheel/BAB370>.
- Freudenreich, Birte; Lüdeke-Freund, Florian; Schaltegger, Stefan (2020): A Stakeholder Theory Perspective on Business Models: Value Creation for Sustainability. In *J Bus Ethics* 166 (1), pp. 3–18. DOI: 10.1007/s10551-019-04112-z.
- GEO (2017): Earth observation for EU Research and Innovation. Group on Earth Observations. Available online at <https://earthobservations.org/article.php?id=201>, checked on 12/13/2021.

- GEO (2021): GEO - Group on Earth Observations | FAQ. Available online at https://www.earthobservations.org/g_faq.html, checked on 12/14/2021.
- GERICS (2015): Climate-Focus-Paper. Cities and Climate Change. Available online at <https://www.kfw-entwicklungsbank.de/PDF/Entwicklungsfinanzierung/Themen-NEU/Focus-Paper-Cities-and-Climate-Change.pdf>, checked on 12/9/2021.
- Gill, Mike; Kavvada, Argyro (2018): Integrating and Visualizing Earth Observation Data for the SDGs. 7th Meeting of the Interagency and Expert Group on Sustainable Development Goal Indicators. Vienna, Austria. Available online at <https://unstats.un.org/sdgs/files/meetings/iaeg-sdgs-meeting-07/11.3%20Earth%20Observation%20Data.pdf>
- Globe NewsWire (2020): Global \$5.75 Billion Commercial Satellite Imaging Market to 2025. In *Research and Markets*, 2020. Available online at <https://www.globenewswire.com/en/news-release/2020/11/26/2134504/28124/en/Global-5-75-Billion-Commercial-Satellite-Imaging-Market-to-2025.html>, checked on 12/14/2021.
- Grant, Robert M. (2019): Contemporary strategy analysis. Tenth Edition. Hoboken, NJ: Wiley. Available online at <http://swbplus.bsz-bw.de/bsz1067857044cov.htm>.
- Humphrey, A.; Doshier, M.; Benepe, O.; Stewart, R. and Lie, B. (1960): The SWOT analysis method. Mento Park, CA: Stanford Research Institute.
- Hunt, Alistair; Watkiss, Paul (2011): Climate change impacts and adaptation in cities: a review of the literature. In *Climatic Change* 104 (1), pp. 13–49. DOI: 10.1007/s10584-010-9975-6.
- Huxley, Margo; Inch, Andy (2020): Urban Planning. In : International Encyclopedia of Human Geography: Elsevier, pp. 87–92.
- JAXA (2020): Seen from Space | 2020 | JAXA Earth Observation Research Center (EORC). Available online at https://www.eorc.jaxa.jp/en/earthview/year_list.php?year=2020, checked on 12/13/2021.
- Kraaijenbrink, Jeroen (2019): What The 3Ps Of The Triple Bottom Line Really Mean. In *Forbes*, 12/10/2019. Available online at <https://www.forbes.com/sites/jeroenkraaijenbrink/2019/12/10/what-the-3ps-of-the-triple-bottom-line-really-mean/>, checked on 11/3/2021.
- KSAT (2021): Oil Spill Detection Service. Available online at <https://www.ksat.no/earth-observation/environmental-monitoring/oil-spill-detection-service/>, checked on 12/14/2021.
- Kumar, Prashant (2021): Climate Change and Cities: Challenges Ahead. In *Front. Sustain. Cities* 3. DOI: 10.3389/frsc.2021.645613.

- Lages, Luis F. (2015): How to Grow, Create and Capture Value in Domestic and International Markets? Working Paper # 599. Lisbon, Portugal.
- Lages, Luis F.; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020): Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem-solving, and lean. In *Strategic Change* 29 (2), pp. 195–213. DOI: 10.1002/jsc.2321.
- Lages, Luis Filipe (2016): VCW—Value Creation Wheel: Innovation, technology, business, and society. In *Journal of Business Research* 69 (11), pp. 4849–4855. DOI: 10.1016/j.jbusres.2016.04.042.
- Lages, Luís Filipe; Fonseca, Vânia; Paulino, Miguel (2018): The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth. In Leonidas C. Leonidou, Constantine S. Katsikeas, Saeed Samiee, Bilge Aykol (Eds.): *Advances in Global Marketing*, vol. 56. Cham: Springer International Publishing, pp. 253–279.
- Lampard, Eric E. (1955): The History of Cities in the Economically Advanced Areas. In *Economic Development and Cultural Change* 3 (2), pp. 81–136. DOI: 10.1086/449680.
- McGill University (2015): About urban planning. Available online at <https://www.mcgill.ca/urbanplanning/planning>, updated on 8/7/2015, checked on 12/8/2021.
- McGrath, Joe (2020): Which global cities are leading on climate change? - ESG Clarity. Available online at <https://esgclarity.com/which-global-cities-are-leading-on-climate-change/>, checked on 12/14/2021.
- Miller, Kelsey (2020): The Triple Bottom Line: What It Is & Why It's Important - Harvard Business School Online. Available online at <https://online.hbs.edu/blog/post/what-is-the-triple-bottom-line>, checked on 10/30/2021.
- Mitraka, Zina; Chrysoulakis, Nektarios (2018): Earth Observation for Urban Climate Monitoring: Surface Cover and Land Surface Temperature. In Rustam B. Rustamov, Sabina Hasanova, Mahfuza H. Zeynalova (Eds.): *Multi-purposeful application of geospatial data*. London: IntechOpen.
- Mordor Intelligence (2020): Global Satellite-based Earth Observation Market | 2021 - 26 | Industry Share, Size, Growth - Mordor Intelligence. Available online at <https://www.mordorintelligence.com/industry-reports/global-satellite-based-earth-observation-market-industry>, checked on 12/14/2021.
- Musakwa, Walter; van Niekerk, Adriaan (2015): Earth Observation for Sustainable Urban Planning in Developing Countries. In *Journal of Planning Literature* 30 (2), pp. 149–160. DOI: 10.1177/0885412214557817.

- NASA (2021): What is Remote Sensing? | Earthdata. Available online at <https://earthdata.nasa.gov/learn/backgrounders/remote-sensing#resolution>, checked on 12/14/2021.
- Norton Rose Fulbright (2021): The EU Green Deal explained. Available online at <https://www.nortonrosefulbright.com/en/knowledge/publications/c50c4cd9/the-eu-green-deal-explained>, checked on 12/13/2021.
- Nova SBE (2020): VCW awarded EUR 550,000 for the European Horizon 2020 Project NextLand. Available online at <https://www2.novasbe.unl.pt/en/faculty-research/highlights/research-news-detail/id/278/vcw-awarded-eur-550000-for-the-european-horizon-2020-project-nextland>, checked on 12/13/2021.
- Porter, Michael E. (1980): *Competitive strategy. Techniques for analyzing industries and competitors*. New York: Free Press.
- Porter, Michael E. (1985): *Competitive advantage. Creating and sustaining superior performance* / Michael E. Porter. New York: Free Press.
- Prakash, Mihir; Ramage, Steven; Kavvada, Argyro; Goodman, Seth (2020): Open Earth Observations for Sustainable Urban Development. In *Remote Sensing* 12 (10), p. 1646. DOI: 10.3390/rs12101646.
- Preston, Sarag (2021): Building a new world: infrastructure monitoring for a more s. planet.com. Available online at <https://www.planet.com/pulse/building-a-new-world-infrastructure-monitoring-for-a-more-sustainable-future/>, checked on 12/14/2021.
- PTI (2021): Cyclone Amphan of 2020 resulted in \$14 billion economic losses in India: U.N. report. In *The Hindu*, 4/20/2021. Available online at <https://www.thehindu.com/news/national/cyclone-amphan-of-2020-resulted-in-14-billion-economic-losses-in-india-un-report/article34364773.ece>, checked on 12/13/2021.523Z.
- Purvis, Katherine (2016): Where are the world's most water-stressed cities? In *The Guardian*, 7/29/2016. Available online at <https://www.theguardian.com/cities/2016/jul/29/where-world-most-water-stressed-cities-drought>, checked on 12/9/2021.
- Reis-Marques, Carlos; Lages, Luís Filipe; Caminati, Valentine Vix (2019): VCW for Social Impact in a Developing Country: Personal Development and Entrepreneurship in a Leadership Academy. In Debra Z. Basil, Gonzalo Diaz-Meneses, Michael D. Basil (Eds.): *Social marketing in action. Cases from around the world* / Debra Z. Basil, Gonzalo Diaz-Meneses, Michael D. Basil, editors. Cham, Switzerland: Springer (Springer Texts in Business and Economics), pp. 141–162.
- Schmale, Julia; Shindell, Drew; Schneidmesser, Erika von; Chabay, Ilan; Lawrence, Mark (2014): Air pollution: clean up our skies. In *Nature* 515 (7527), pp. 335–337. DOI: 10.1038/515335a.

- Schweikert, Amy; Espinet, Xavier; Chinowsky, Paul (2018): The triple bottom line: bringing a sustainability framework to prioritize climate change investments for infrastructure planning. In *Sustain Sci* 13 (2), pp. 377–391. DOI: 10.1007/s11625-017-0431-7.
- Simon, David (1987): Our Common Future: Report of the World Commission on Environment and Development (Book Review). In *Third World Planning Review* 9 (3), pp. 1–420. DOI: 10.3828/twpr.9.3.x4k73r2p72w22402.
- Smith, Adam; Channan, E. (1976): An enquiry into the nature and causes of The wealth of nations. S.I.: University of Chicago Press.
- Sullivan, Helen (2021): 14 dead in New York region amid ‘historic’ flooding caused by Ida remnants. In *The Guardian*, 9/2/2021. Available online at <https://www.theguardian.com/us-news/2021/sep/02/new-york-flooding-state-of-emergency-ny-city-flash-flood-nyc-hurricane-ida-remnants>, checked on 12/9/2021.
- Taubenböck, Hannes; Wurm, Michael; Esch, Thomas; Heldens, Wieke (Eds.) (2010): From Earth Observation to Urban Planning in Cities. PLUREL Conference. Copenhagen, Denmark, 19 – 22 October 2010.
- The Decision Lab (2021): The Paradox of Choice - The Decision Lab. Available online at <https://thedecisionlab.com/reference-guide/economics/the-paradox-of-choice/>, checked on 12/14/2021.
- UN (2015a): ADOPTION OF THE PARIS AGREEMENT - Paris Agreement text English. Available online at https://ggim.un.org/documents/a_res_71_313.pdf, checked on 12/9/2021.
- UN (2015b): Earth observations in support of national strategies for disaster-risk management. A Synergy Framework for the integration of Earth Observation technologies into Disaster Risk Reduction. Available online at https://www.un-spider.org/sites/default/files/White_paper_Earth%20observations%20for%20DRR.pdf.
- UN (2017): Resolution adopted by the General Assembly on 6 July 201. Available online at https://ec.europa.eu/regional_policy/sources/policy/themes/urban-development/agenda/pact-of-amsterdam.pdf.
- UN (2018): World Urbanization Prospects. The 2018 Revision. United Nations, Department of Economic and Social Affairs, Population Division. Available online at <https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf>.
- UN (2021a): COP26: Together for our planet | United Nations. Available online at <https://www.un.org/en/climatechange/cop26>, checked on 12/9/2021.
- UN (2021b): Goal 11 | Department of Economic and Social Affairs. Available online at <https://sdgs.un.org/goals/goal11>, checked on 12/13/2021.

UNEP (2017): Cities and climate change. UN Environment. Available online at <https://www.oecd.org/env/cc/Cities-and-climate-change-2014-Policy-Perspectives-Final-web.pdf>, checked on 12/9/2021.

Value Creation Wheel (2020): VCW Method & Impact. Available online at <https://www.valuecreationwheel.com/vcw-method/>, checked on 12/14/2021.

Weidner, Kelly; Nakata, Cheryl; Zhu, Zhen (2021): Sustainable innovation and the triple bottom-line: a market-based capabilities and stakeholder perspective. In *Journal of Marketing Theory and Practice* 29 (2), pp. 141–161. DOI: 10.1080/10696679.2020.1798253.

REFERENCES (Mathilde)

Amsterdam Smart City. 2021. *Home - Amsterdam Smart City*. [online] Available at: <<https://amsterdamsmartcity.com>> [Accessed 22 November 2021].

BBC News. 2016. *Five reasons why buildings collapse*. [online] Available at: <<https://www.bbc.com/news/world-africa-36205324>> [Accessed 10 December 2021].

Brokke, K., 2021. *Amsterdam has been collapsing for years. Now it's paying the price*. [online] CNN. Available at: <<https://edition.cnn.com/travel/article/amsterdam-collapsing/index.html>> [Accessed 20 November 2021].

Cia.gov. 2021. [online] Available at: <<https://www.cia.gov/the-world-factbook/countries/netherlands/>> [Accessed 7 November 2021].

Citego.org. 2014. *Amsterdam Smart City: the creation of new partnerships for a smart city*. [online] Available at: <http://www.citego.org/bdf_fiche-document-883_en.html> [Accessed 17 November 2021].

Data.worldbank.org. 2021. *Ease of doing business rank (1=most business-friendly regulations) | Data*. [online] Available at: <<https://data.worldbank.org/indicator/IC.BUS.EASE.XQ>> [Accessed 15 October 2021]. (g)

Data.worldbank.org. 2020. *GDP per capita (current US\$) | Data*. [online] Available at: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?name_desc=false> [Accessed 15 October 2021]. (a)

Data.worldbank.org. 2021. *Land area where elevation is below 5 meters (% of total land area) |*

Data. [online] Available at: <<https://data.worldbank.org/indicator/AG.LND.EL5M.ZS?view=chart>> [Accessed 15 October 2021]. (d)

Data.worldbank.org. 2021. *Population living in slums (% of urban population)* | Data. [online] Available at: <<https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?view=chart>> [Accessed 15 October 2021]. (f)

Data.worldbank.org. 2021. *Population in urban agglomerations of more than 1 million (% of total population)* | Data. [online] Available at: <<https://data.worldbank.org/indicator/EN.URB.MCTY.TL.ZS?view=chart>> [Accessed 15 October 2021]. (c)

Data.worldbank.org. 2021. *Urban population (% of total population)* | Data. [online] Available at: <<https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>> [Accessed 15 October 2021]. (b)

Databank.worldbank.org. 2015. *World Development Indicators* | DataBank. [online] Available at: <https://databank.worldbank.org/reports.aspx?id=d092076d&Report_Name=WDI_Population> [Accessed 15 October 2021].

Databank.worldbank.org. 2021. *Worldwide Governance Indicators* | DataBank. [online] Available at: <<https://databank.worldbank.org/source/worldwide-governance-indicators>> [Accessed 15 October 2021]. (e)

Disasterdoc.org. 2021. [online] Available at: <<https://disasterdoc.org>> [Accessed 11 October 2021].

Earth.Org - Past | Present | Future. 2020. *Sea Level Rise Projection Map - Amsterdam* | Earth.Org - Past | Present | Future. [online] Available at: <https://earth.org/data_visualization/sea-level-rise-by-2100-amsterdam/> [Accessed 18 November 2021].

Ef.com. 2021. *EF EPI 2021 – EF English Proficiency Index*. [online] Available at: <<https://www.ef.com/wwen/epi/>> [Accessed 1 November 2021].

Ehs.unu.edu. 2016. *5 facts about Dutch flood risk management - Institute for Environment and Human Security*. [online] Available at: <<https://ehs.unu.edu/news/news/5-facts-about-dutch-flood-risk-management.html>> [Accessed 15 November 2021].

Erdbrink, T., 2021. *Sinkholes, Collapsing Canal Walls, Rickety Bridges: Amsterdam Is Crumbling*. [online] Nytimes.com. Available at: <<https://www.nytimes.com/2021/06/05/world/europe/amsterdam-crumbling-infrastructure-canal.html>> [Accessed 18 November 2021].

Euromonitor. 2014. *Global Urbanisation Trend Boosting Apartment Dwelling*. [online] Available at: <<https://www.euromonitor.com/article/global-urbanisation-trend-boosting-apartment-dwelling>> [Accessed 11 October 2021]

Eurisy. 2021. *Earth Observation data for bridge monitoring in Amsterdam*. [online] Available at: <https://www.eurisy.eu/stories/amsterdam-earth-observation-data-for-bridge-monitoring_260/> [Accessed 16 November 2021].

GEODAQ. 2021. *Home*. [online] Available at: <<https://geodaq.net>> [Accessed 29 November 2021].

Geomotion. 2021. *RELIABILITY OF INSAR SATELLITE MONITORING OF BUILDINGS*. [online] Available at: <<https://www.geomotion.com.au/news-hub/reliability-of-insar-satellite-monitoring-of-buildings>> [Accessed 26 November 2021].

Germanwatch.org. 2021. *GLOBAL CLIMATE RISK INDEX 2021*. [online] Available at: <https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf> [Accessed 1 November 2021].

Glassdoor. 2021. *Top Construction Companies in Amsterdam, Netherlands Area*. [online] Available at: <https://www.glassdoor.com/Explore/top-construction-companies-amsterdam_IL.4,16_IIND200036_IL.27,36_IM1112.htm> [Accessed 20 November 2021].

2021. *HVAC flexibility & Energy monitoring in EDGE Amsterdam multi-tenant healthy & smart office*. [online] Available at: <[https://www.danfoss.com/en/service-and-support/case-stories/dhs/hvac-flexibility-energy-monitoring-in-edge-amsterdam-multi-tenant-healthy-smart-office/](https://www.danfoss.com/en/service-and-support/case-stories/dhs/hvac-flexibility-energy-monitoring-in-edge-amsterdam-multi-tenant-healthy-smart-office/https://www.danfoss.com/en/service-and-support/case-stories/dhs/hvac-flexibility-energy-monitoring-in-edge-amsterdam-multi-tenant-healthy-smart-office/)> [Accessed 16 November 2021].

iamsterdam.com. 2018. *5 Dutch companies building a sustainable future | I amsterdam*. [online] Available at: <<https://www.iamsterdam.com/en/business/news-and-insights/news/2018/5-dutch-companies-building-a-sustainable-future>> [Accessed 21 November 2021].

Kara, H., 2021. *"How can a building just collapse?" Hanif Kara shares lessons in building safety*. [online] Harvard Graduate School of Design. Available at: <<https://www.gsd.harvard.edu/2021/07/how-can-a-building-just-collapse-hanif-kara-shares-lessons-in-building-safety/>> [Accessed 10 October 2021].

Katja Brokke, C., 2020. *Amsterdam has been collapsing for years. Now it's paying the price*. [online] CNN. Available at: <<https://edition.cnn.com/travel/article/amsterdam-collapsing/index.html>> [Accessed 18 November 2021].

Keim, M., 2021. *When Buildings Collapse*. [online] Disasterdoc.org. Available at: <<https://disasterdoc.org/when-buildings-collapse/>> [Accessed 10 October 2021].

Latitudo 40. 2021. *Home - Latitudo 40*. [online] Available at: <<https://www.latitudo40.com/>> [Accessed 10 September 2021].

PBL Netherlands Environmental Assessment Agency. 2016. *Subsiding soils, rising costs*. [online] Available at: <<https://www.pbl.nl/en/publications/subsiding-soils-rising-costs>> [Accessed 18 November 2021].

Quell, M., 2020. *The Netherlands is sinking and here's why*. [online] Mother Jones. Available at: <<https://www.motherjones.com/environment/2020/01/the-netherlands-is-sinking-and-heres-why/>> [Accessed 25 November 2021].

Rezatec. 2021. *Innovative Geospatial AI | Rezatec*. [online] Available at: <<https://www.rezatec.com>> [Accessed 24 October 2021].

Sdgs.un.org. 2021. *Home | Sustainable Development*. [online] Available at: <<https://sdgs.un.org>>

[Accessed 12 September 2021].

Sensar. 2021. *Home* | Sensar. [online] Available at: <<https://www.sensar.nl>> [Accessed 19 November 2021].

SkyGeo. 2021. *Increase insights, reduce risk with the world's best InSAR platform..* [online] Available at: <<https://skygeo.com>> [Accessed 13 November 2021].

Statista. 2017. *Netherlands: biggest construction companies* | Statista. [online] Available at: <<https://www.statista.com/statistics/968572/largest-construction-companies-based-on-revenue-in-the-netherlands/>> [Accessed 16 November 2021].

the Guardian. 2021. *Search for bodies in Florida condo collapse ends, with death toll at 97.* [online] Available at: <<https://www.theguardian.com/us-news/2021/jul/23/search-for-bodies-in-florida-condo-collapse-ends-with-death-toll-at-97>> [Accessed 10 October 2021].

Tpex.com. 2021. *Smart Building Operations and Certification* | TPEX International | Building Intelligence. [online] Available at: <<https://www.tpex.com/services/smart-building-operations-and-certification/>> [Accessed 26 November 2021].

Tpex.com. 2021. *TPEX International* | Building Intelligence | TPEX International | Building Intelligence. [online] Available at: <<https://www.tpex.com>> [Accessed 27 November 2021].

Un.org. 2018. *68% of the world population projected to live in urban areas by 2050, says UN* | UN DESA | United Nations Department of Economic and Social Affairs. [online] Available at: <<https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>> [Accessed 9 October 2021].

World Economic Forum. 2021. *The World Economic Forum.* [online] Available at: <<https://www.weforum.org/>> [Accessed 14 October 2021].

Worldometers.info. 2021. *Countries in the United Nations - Worldometer.* [online] Available at: <<https://www.worldometers.info/united-nations/>> [Accessed 15 September 2021].

Worldpopulationreview.com. 2021. *Population of Cities in Netherlands (2021).* [online] Available at: <<https://worldpopulationreview.com/countries/cities/netherlands>> [Accessed 15 November 2021].

2021. [online] Available at: <<https://climate-adapt.eea.europa.eu/>> [Accessed 10 October 2021].

APPENDIX

Figure n°1: SWOT Analysis of Latitudo 40.

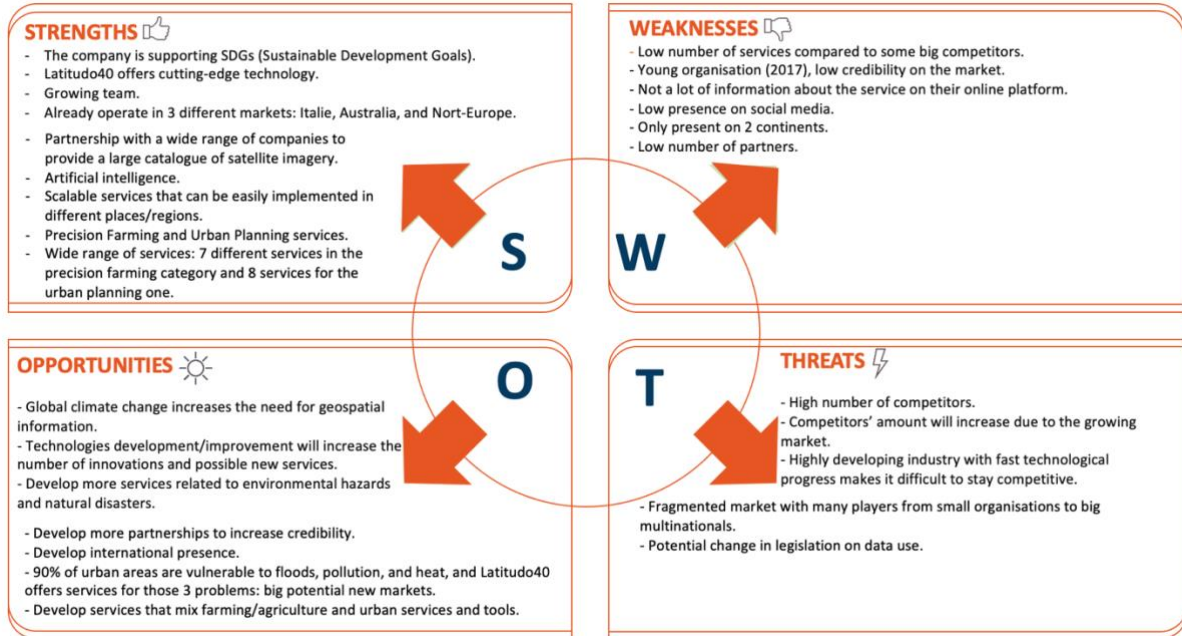


Figure n°2: TOWS Analysis of Latitudo 40.

TOWS	STRENGTHS	WEAKNESSES
OPPORTUNITIES	<ul style="list-style-type: none"> • Target urban risky areas to sell urban planning/monitoring services. • Use partner's awareness to find new customers. 	<ul style="list-style-type: none"> • Develop the online platform to make it more competitive by providing more information about the added value of Latitudo 40's services. • Develop services linked to disasters management and environmental hazards.
THREATS	<ul style="list-style-type: none"> • Export services into a new market to increase international awareness. • Develop marketing/communication of the company for more visibility. 	<ul style="list-style-type: none"> • Because of the high number of competitors and the youth of the organization, Latitudo40 should create more partnerships to stay competitive and increase its credibility on the market. • Reach new markets outside Europe, in Asia, or Indonesia with coastal urban areas.

Figure n°3: PESTEL Analysis.

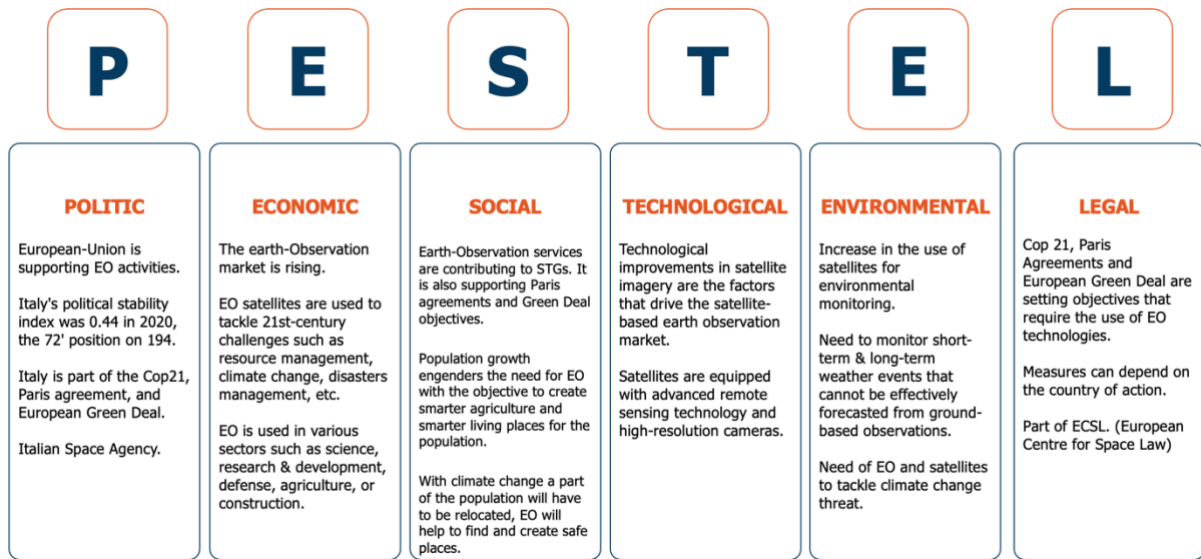


Figure n°4: PORTER 5 FORCES Analysis.

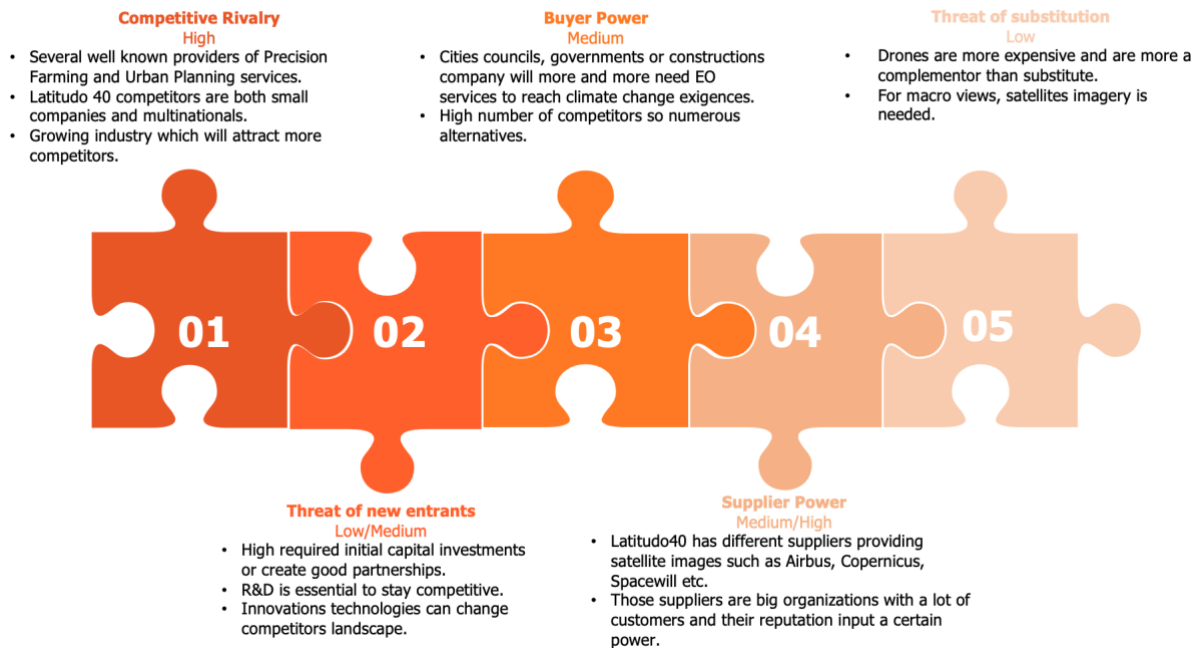


Table n°1: Analysis of Latitudo 40 competitors.

COMPANY NAME	NATIONALITY	SERVICES	BUILDING MONITORING SERVICE	TECHNOLOGY	PARTNERS	COMPANY SIZE	DIRECT / INDIRECT
GeoAlert	Russian	Urban Mapping, Map flow, Development and construction	Building mapping and monitoring	Satellites.	Maxar, kontur, MTS, etc.	< 25 employees	Direct
UP 42	German	Developer platform for earth insights	Structures monitoring	Satellites.	X	Around 70 Founded in 2019	Direct
EOS	American	Precision Agriculture, Construction, transportation, etc.	Construction monitoring and real estate service.	Satellite imagery.	Acacia, Ika, Wingou, etc.	x	Direct
Sensar	Dutch	Urban planning, EO.	Use satellite technology to assess risky buildings.	Satellite imagery.	x	10 employees on linkedin.	Direct
Sky Geo	American	Monitoring for civil engineering projects	Site selection, development and maintenance.	AI, ML	x	Founded in 2014 34 employees	Direct
GEO DAQ	American	Construction monitoring	Building monitoring service: PRO5 modules is assessing	Digital sensor module	x	< 25 employees	Direct
Structural Vibration Solutions A/S	Danish	Operational modal analysis	Structural health monitoring	Structural vibration solutions.	X	Founded in 1999 < 25	Direct
OS GEO	American	Mapping service / Geospatial foundation	x	Satellite imagery.	Map gears, Astun, where group, etc.	x	Indirect
Soboot	Dutch	Applications, 3D modeling, city maps, etc.	Infrastructure assessment but no monitoring and not an automated	Drones, AI.	X	x	Indirect
Picterra	French	ESG reporting Railway networks Oil & gas pipelines	Doesn't have a building service but roads/railway network.	Satellites.	Westwood, ICA, Cyient, SGS, Stabag	x	Indirect
CAPE	American	Real estate insurance	Assess property condition, Monitoring.	x	AXA, Kin, Hippo, etc.	x	Indirect
URBAN LOGIQ	American	Provide data, build solutions	No building monitoring service.	AI.	X	x	Indirect
Green Urban Data	Spanish	Saas Environmental Index, Saas Temperature	Environment, Temperature, roads but no building	Satellite imagery.	X	x	Indirect
Urban Data Analytics	Spanish	Real Estate Valuation, Allocation and Origination of	Houses, Buildings assessment, not focusing on health.	x	Odine, Mipim, ProTechMap, etc.,	x	Indirect

Table n°2: Stakeholders Involvement during the project.

STAKEHOLDER TYPE	COMPANY	NAME	POSITION	INTERVENTION
Internal	Nova SBE	Mr. Lages Luis Filipe.	Supervisor of the Field Lab.	Phase 1 Phase 2 Phase 3 Phase 5
Internal	Latitudo 40	Gaetano Volpe	Founder & CEO	Phase 1 Phase 5
Internal	Latitudo 40	Mauro Manente	Founder & Chief Technical Officer of Latitudo40	Phase 1 Phase 2 Phase 3 Phase 4 Phase 5
Internal	Nova SBE	Tim Lütge	VCW Field Lab member	Phase 2 Phase 3
Internal	Nova SBE	Sebastian Borde	VCW Field Lab member	Phase 2 Phase 3
External	Tesselo	Rémi Charpentier	CEO	Phase 1
External	Rezatec	Lucien Wynn	Executive Management, CTO	Phase 2
External	EOS	Vera Petryk	Chief Marketing Officer	Phase 1
External	Rezatec	Hannah Attack	Chief people officer	Phase 1

Figure n°5: Key Performance Indicators.

	Descriptive KPIs	Reasoning	Term
Project Management KPIs	Meetings planned in advance.	To ensure efficient communication and regular feedback, it is important to plan meetings for direct discussions. For less important aspects, a WhatsApp group is used with the field lab team and supervisors, while communication with Latitudo40 is made by email and online meetings.	Medium
	Regular questioning of decisions to make sure to take the good ones.	Plan meeting for KDMs and team members' feedbacks after every phase or big step or the process.	Medium
	Strong involvement of KDM and stakeholders.	Make sure KDM is giving feedbacks. Strong involvement of internal and external Stakeholders.	Medium
	Develop the team to have an employee dedicated to the buildings monitoring service.	The buildings monitoring service is promising and if its implementation in the new market is a success, it could be an opportunity to dedicate one employee to its development/management.	Long
Company Development KPIs	Find a promising geographical market	The targeted market must be promising for the future and add value to Latitudo40 as new implantation.	Medium
	Build a stable competitive position in the targeted city	Make sure the service is matching local needs and benefiting to local customers.	Medium
	Find at least 3 potential customers in the city	With good service and customer relations, 3 potential customers are enough to make sure Latitudo40 will successfully enter the market.	Medium
	Maximum of 4 direct competitors in the new city	Direct competitors are offering buildings monitoring thanks to satellite technology, if more than 4 are already present in the city, it would be difficult for Latitudo40 to establish a position in the market.	Medium
	Establish solid partnership with 1 company or city council of the targeted city	It will not only allow the company to expand its network but also offer precious knowledge and solid entrance.	Long
	Retain customers and support them in their activities	A good relationship with customers will be essential to develop company awareness in the new market.	Long
	Expand to other cities in the new targeted country	As we selected a promising geographical market, it will offer the possibility to expand to different cities of this new market.	Long

Figure n°6: The 53 filters.

3 - 6 - 5 Brainwriting method: 36 filters				Individual Research: 10 filters	
Filter	Poker Method	Filter	Poker Method	Filter	Poker Method
Earthquakes risk	Review	Country risk	Review	Political stability of the country	Keep
Old Architectural cities	Kill	Ground stability	Review	Use of EO (common or not)	Kill no info
Cities with most collapses	Review	Yearly loss due to bad infrastructures	Kill (repeat)	Population (number of inhabitants)	Kill
Most Dense cities	Review	Yearly collapses	Kill (repeat)	Population growth (annual %age)	Kill
Population density	Keep	Percentage of population living in city	Kill	Economic freedom index	Kill
Population per Km2	Review	Moisture index	Kill no info	% population living in a city > 1 million inhabitants	Keep
Percentage of GDP from real estate sector	Kill no info	Percentage of population working in infrastructure sector	Kill no info	% urban population	Keep
Percentage of population moving from land to urban areas	Review	Amount of buildings with more than 10 floors	Kill no info	Infrastructure technologies to resist to environmental disasters	Kill no info
Ease of doing Business	Keep	Infrastructure Index	Keep	Population living in slums	Keep
Risk with sea level raise	Review	Intensity of natural disasters	Review	Seismics risks	Kill
Recent development of new cities	Kill	Age of the foundations	Multiply	Internal & External Stakeholders: 7 filters	
Most recent collapse accidents	Kill	Ease of doing business	Keep	Filter	Poker Method
Number of inhabitants per buildings	Review	Type of material used for constructions	Multiply	Runoff Risk	kill no info
Type of habitation most used in the country	Review	Average number of apartments per building	Kill no info	Urban movements	kill no info
Cities with most collapses	Review	Frequency of environmental natural disasters	Review	Urban modifications: last renovation	kill no info
Urban or countryside population	Kill	Average price of m2	Review	Floods risks	Review
GDP per capita	Keep	Yearly loss due to house fires	Kill	Climate risk	Keep
Date of last renovation	Kill	Number of skyscrapers	Kill	English level / Communication	Keep
				%age of recent infrastructure	kill no info

Table n°3: MCDA.

Filter #	Filter 1	Filter 2	Filter 3	Filter 4	Filter 5	Filter 6	Filter 7	Filter 8	Filter 9	Filter 10	Filter 11	Attractiveness (sum assuming same weights for each filter)
FILTER NAME	GDP PER CAPITA	CLIMATE RISK INDEX	INFRASTRUCTURE INDEX	% URBAN POPULATION	POPULATION DENSITY	ELEVATION BELOW 5 METERS	POLITICAL RISK INDEX	ENGLISH RANKING	% OF POPULATION LIVING IN CITY WITH MORE THAN 1 MILLION INHABITANTS	% POPULATION LIVING IN SLUMS	EASE OF DOING BUSINESS	
Japan	1	1	1	1	1	1	1	0	1	0	0	8
Lebanon	0	1	1	1	1	0	1	0	1	1	1	8
Netherlands	1	1	1	1	1	1	1	1	1	0	0	8
Singapore	1	0	1	1	1	1	1	1	1	0	0	8
Belgium	1	0	1	1	1	1	1	1	1	0	0	7
Canada	1	1	1	1	0	0	1	1	1	0	0	7
Denmark	1	1	1	1	0	1	1	1	0	0	0	7
Israel	1	1	1	1	1	0	1	0	1	0	0	7
Latvia	1	1	1	1	0	1	1	1	0	0	0	7
Portugal	1	1	1	1	0	0	1	1	1	0	0	7
Uruguay	1	1	1	1	0	0	1	0	1	0	1	7
Argentina	0	0	1	1	0	0	1	1	1	0	1	6
Australia	1	0	1	1	0	0	1	1	1	0	0	6
Bahamas, The	1	0	1	1	0	1	1	0	0	0	1	6
Brazil	0	1	1	1	0	0	1	0	1	0	1	6
Czech Republic	1	1	1	1	0	0	1	1	0	0	0	6
Estonia	1	1	1	1	0	0	1	1	0	0	0	6
Finland	1	1	1	1	0	0	1	1	0	0	0	6
France	1	1	1	1	0	0	1	1	0	0	0	6
Germany	1	1	1	1	0	0	1	1	0	0	0	6
Hungary	1	1	1	1	0	0	1	1	0	0	0	6
Iceland	1	1	1	1	0	1	1	0	0	0	0	6
Ireland	1	1	1	1	0	0	1	1	0	0	0	6
Italy	1	1	1	1	0	0	1	1	0	0	0	6
Korea, Rep.	1	1	1	1	0	0	1	0	1	0	0	6
Luxembourg	1	1	1	1	0	0	1	1	0	0	0	6
Malta	1	1	1	1	0	0	1	0	0	0	0	6
Mongolia	0	1	1	1	0	0	1	0	1	1	0	6
New Zealand	1	1	1	1	0	0	1	1	0	0	0	6
Norway	1	1	1	1	0	0	1	1	0	0	0	6
South Africa	0	1	1	1	0	0	1	1	1	0	0	6
Spain	1	1	1	1	0	0	1	1	0	0	0	6
Sweden	1	1	1	1	0	0	1	1	0	0	0	6
United States	1	0	1	1	0	0	1	1	0	0	0	6
Algeria	0	1	1	1	0	0	1	1	0	0	1	5
Armenia	0	1	1	1	0	0	1	0	1	0	0	5
Austria	1	1	1	1	0	0	1	1	0	0	0	5
Bahrain	0	0	1	1	0	1	1	0	0	0	0	5
Bangladesh	0	1	1	0	1	0	1	0	0	1	0	5
Bolivia	0	1	0	1	0	0	0	0	1	1	1	5
Burundi	0	1	1	0	1	0	0	0	0	1	1	5
Chile	1	0	1	1	0	0	1	0	1	0	0	5

Table n°4: VCF.

Filter #	Filter 1	Filter 2	Filter 3	Filter 4	Filter 5	Filter 6	Filter 7	Filter 8	Filter 9	Filter 10	Filter 11	Attractiveness (sum assuming same weights for each filter)
FILTER NAME	GDP PER CAPITA	CLIMATE RISK INDEX	INFRASTRUCTURE INDEX	% URBAN POPULATION	POPULATION DENSITY	ELEVATION BELOW 5 METERS	POLITICAL RISK INDEX	ENGLISH RANKING	% OF POPULATION LIVING IN CITY WITH MORE THAN 1 MILLION INHABITANTS	% POPULATION LIVING IN SLUMS	EASE OF DOING BUSINESS	
Netherlands	1	1	1	1	1	1	1	1	-	-	-	8
Japan	1	1	1	1	1	1	1	-	-	-	-	7
Israel	1	1	1	1	1	-	-	-	-	-	-	5
Malta	1	1	1	1	1	-	-	-	-	-	-	5
Canada	1	1	1	1	-	-	-	-	-	-	-	4
Czech Republic	1	1	1	1	-	-	-	-	-	-	-	4
Denmark	1	1	1	1	-	-	-	-	-	-	-	4
Estonia	1	1	1	1	-	-	-	-	-	-	-	4
Finland	1	1	1	1	-	-	-	-	-	-	-	4
France	1	1	1	1	-	-	-	-	-	-	-	4
Germany	1	1	1	1	-	-	-	-	-	-	-	4
Hungary	1	1	1	1	-	-	-	-	-	-	-	4
Iceland	1	1	1	1	-	-	-	-	-	-	-	4
Ireland	1	1	1	1	-	-	-	-	-	-	-	4
Italy	1	1	1	1	-	-	-	-	-	-	-	4
Latvia	1	1	1	1	-	-	-	-	-	-	-	4
Luxembourg	1	1	1	1	-	-	-	-	-	-	-	4
New Zealand	1	1	1	1	-	-	-	-	-	-	-	4
Norway	1	1	1	1	-	-	-	-	-	-	-	4
Portugal	1	1	1	1	-	-	-	-	-	-	-	4
Spain	1	1	1	1	-	-	-	-	-	-	-	4
Sweden	1	1	1	1	-	-	-	-	-	-	-	4
Switzerland	1	1	1	1	-	-	-	-	-	-	-	4
United Kingdom	1	1	1	1	-	-	-	-	-	-	-	4
Uruguay	1	1	1	1	-	-	-	-	-	-	-	4
Austria	1	1	1	1	-	-	-	-	-	-	-	3
Croatia	1	1	1	1	-	-	-	-	-	-	-	3
Slovak Republic	1	1	1	1	-	-	-	-	-	-	-	3
Slovenia	1	1	1	1	-	-	-	-	-	-	-	3
Antigua and Barbuda	1	-	-	-	-	-	-	-	-	-	-	1
Australia	1	-	-	-	-	-	-	-	-	-	-	1
Bahamas, The	1	-	-	-	-	-	-	-	-	-	-	1
Barbados	1	-	-	-	-	-	-	-	-	-	-	1
Belgium	1	-	-	-	-	-	-	-	-	-	-	1
Brunei Darussalam	1	-	-	-	-	-	-	-	-	-	-	1
Chile	1	-	-	-	-	-	-	-	-	-	-	1
Cyprus	1	-	-	-	-	-	-	-	-	-	-	1
Greece	1	-	-	-	-	-	-	-	-	-	-	1
Korea, Rep.	1	-	-	-	-	-	-	-	-	-	-	1
Lithuania	1	-	-	-	-	-	-	-	-	-	-	1
Poland	1	-	-	-	-	-	-	-	-	-	-	1
Qatar	1	-	-	-	-	-	-	-	-	-	-	1
Saudi Arabia	1	-	-	-	-	-	-	-	-	-	-	1

Table n°5: Potential Customers in the Netherlands.

Company name	Location in Netherlands	Sector of activity	About the Company	Services	Financial	Company Size
Fluor	Hoofddorp	Civil Engineering and construction	Fluor is ranked 196 among the Fortune 500 companies. Headquarter in Texas. The company is providing procurement, ingenering and construction services since	Engineering & Design Procurement Fabrication Construction Maintenance	It has generates \$15,668 million in sales (USD) for the year 2020.	Around 53350 employees around the world. 35 locations.
Deems	Klokegebouw	Engineering/ consulting	Thanks to their expert level for installation technologies, energy supply and buildings the company is providing advices to constructions companies and other private companies. They have also work with governments.	Consulting services.	€ 52 million revenue in 2011.	More than 500 employees.
WSP	Tramsingel	Construction and consulting	Create 130 years ago, the company is bulding sustainable constructions and offering consulting services to governments and private companies.	Engineering consulting services.	2020 anual financial report: \$8 billion canadian dollar revenues.	50 000 employees.
TPEX	Amsterdam	Construction	Focused on smart buildings constructions. Thanks to AI and video surveillance the company is providing buildings monitoring. Created in 2010.	Converged Building Infrastructures Smart Building Operations and Certification		35 employees.
BAM	Bunnik	Civil Engineering, construction & management facilities.	The company is helping its customers to improve quality and durability of their infrastructures. The company has set the objective to decrease from 50% its CO2 emissions by 2030 to built a sustainable future.	Consulting services	€6,8 billion revenues in 2020.	Around 19 430 employees around the world.
Amsterdam Smart City project	Amsterdam	Urban development	The aim of this platform is to support Amsterdam smarter development, to work and live in an healthy city. The project is focusing on innovations and partnership with privates companies to develop the city and different projects related with infrastructures. It is making action and creating partnerships to support the Intelligent Cities Challenge (ICC) which is an European Commission Initiative to encourage cities to use cutting edge technologies for a greener and sustainable future. The city of Amsterdam is a partner of the platform. Each project has its own funding system.	Development of intelligent transport system Innovations for safer mobility Development of sensor data to improve operations.		Around 24 partners such as the city if Amsterdam, Nemo or drift.
Volkerwessels	Amersfoort	Construction	International construction company.	Circuit renovation Creation of a green valley in the city Sustainable homes buildings	\$1,18 billion in 2019.	Around 16 130 employees in 2017.
Heijmans	Rosmalen	Construction and infrastructures	Created in 1923 the aim of the company is to create an healthy living environment.	Construction services.	€1,746 million in 2020 according to their financial report.	4,725 employees.
Ten Brinke Group B.V	Rotterdam	Project Development /Construction / Asset management	Created 120 years ago. The company is building and managing project in various places such as Germany, Spain, Netherlands, etc.	Project management and development Construction	Turnover around \$1 billion per year.	1,200 employees.
Dura Vermeer Groep NV	Varsseveld	Construction	It is one of the 10 first construction company in the Netherlands. Residencials and non-residencials constructions with a sustainable approach. The company is also working on infrastructures such as highway renovations.	Construction services.	\$1,5 billion turnover.	2,800 employees.
Arcadis	Amsterdam	Design, Engineering and consultancy	The company is adressing global challenges to create value for people and communities and improve life quality.	The company is offering services in different field such as architecture, business advisory, Design and Engineering, Environmental restoration etc.	\$3,5 billion revenues in 2019.	28 thousand employees in over 70 countries.
DPK Construction	Amsterdam	Construction	Top 25 contractors of the country.	Various projects but all based on a sustainable approach. They can have different projects such as hospitals, laboratories, manufacturing, renovations or buildings.	\$6 billion revenue in 2019.	5 900 employees.

Figure n°7: 3 Potential Customers in Amsterdam



 <p>TPEX International • Building Intelligence</p>	 <p>Amsterdam Economic Board Amsterdam Smart City</p>	 <p>ARCADIS</p>
SMART CONSTRUCTION COMPANY	ORGANISATION / PLATFORM	DESIGN, ENGINEERING & CONSULTANCY
<p>Focus on Smart Building's construction.</p> <p>Created in 2010, Dutch company based in Amsterdam.</p> <p>Use AI and Video Surveillance to monitor buildings.</p>	<p>Support Amsterdam Smarter Development</p> <p>Innovation & Partnership with private companies.</p> <p>City of Amsterdam as a Partner</p> <p>24 different partners</p>	<p>Improve life quality</p> <p>Architecture, Design, Engineering, Renovations.</p> <p>\$3.9 billion in 2019</p> <p>28 thousand employees.</p>

Table n°6: Competitors in Amsterdam.

Company name	Sector of activity	About the Company	Service competing	Financial	Company Size	Direct/Indirect competition
Arup	Architecture, Engineering and real estate.	Created 75 years ago the company aim is to develop a sustainable built environment.	The company is offering expertise in various fields such as cities, energy, healthcare, retail, hotels, etc. The company is using satellite imageries. In their buildings service category they are offering different services from the architecture to the sustainability.	£1,809 million revenues in 2020 according to their Financial report.	15 608 employees in 2020.	Indirect competition. Arup has an entire category of services focusing on buildings technologies and analysis but it is more related to buildings performance and emission than safety.
Sensar	Urban planning, Earth Observation	Reduce ground deformation risks using satellite to monitor changes.	In their city scan category of services, they have a buildings service: thanks to satellite technologies they are assessing risky buildings and creating maps. The company is working with both small and large cities.	Unknown	Small company (10 employees in linkedin).	Direct competitor of Latitudo40, their services are really similar. Sensar provides case studies and more information about its service than Latitudo40.
FABRICations	Urban planning, Architecture and regional analysis.	FABRICations aim is to develop resilient cities.	Different services are offered such as sustainability scan, sustainability design, or urban metabolism. The company is using satellite technologies to provide all the information needed for a specific project.	Unknown	Around 300 employees.	Indirect competitors because not focusing only on buildings but more broadly at a city level. However, they would have the knowledge and technologies to create maps with buildings analysis.
SkyGeo	EO, consulting.	Founded in 2014, use technology to increase insights and reduce risks.	Monitoring for civil engineering projects	Unknown	Small company <25 employees.	Direct competitor because use of satellite technology and intuitive platform. Furthermore, Amsterdam city has already work with Skygeo in the past for bridges monitoring.
Madaster	Gather and record constructions/buildings informations	Platform similar to NextLand's one, has also received fundings from the Horizon2020 project.	Cadastral plans of materials and buildings. The company is targeting real estate owners, infrastructure/construction companies, entrepreneurs or architects. With all the informations such as materials used, age of the infrastructure, quality, origine, location, etc. Madaster can provide the value of a building. However, the company is not using satellite technologies to create a map or assess environment risks for the buildings.	55 million revenues.	30 employees.	Indirect competition because the company is not using satellite technology so it can not provide as many informations as Latitudo40 yet. However the company is providing essential informations about infrastructures health.
Socotec	Structural monitoring, construction, real estate.	Socotec aims is to provide structural monitoring to all type of construction projects.	The company is working on various projects such as highways, airports, tunnels, seaports, etc. The company is offering a building control service which is providing a lot of important informations such as buildings safety, solidity, seismic risks, etc.	5907 million revenues in 2020.	8 700 employees.	Indirect competitors because it seems that the french company is not using satellite technologies but many others such as sensor or Artificial intelligence.
Royal HaskoningDHV	Urban development, Infrastructures, aviation	Created 140 years ago, the company is offering engineering expertise, software solutions and digital technologies.	Its buildings service category aim is to provide sustainable and innovative buildings solutions. It is assessing safety, durability, sustainability, and health of buildings.	€28 million revenues in 2020.	6 000 employees.	Indirect because we miss information about technologies used to assess buildings.

Figure n°8: Value Curve.

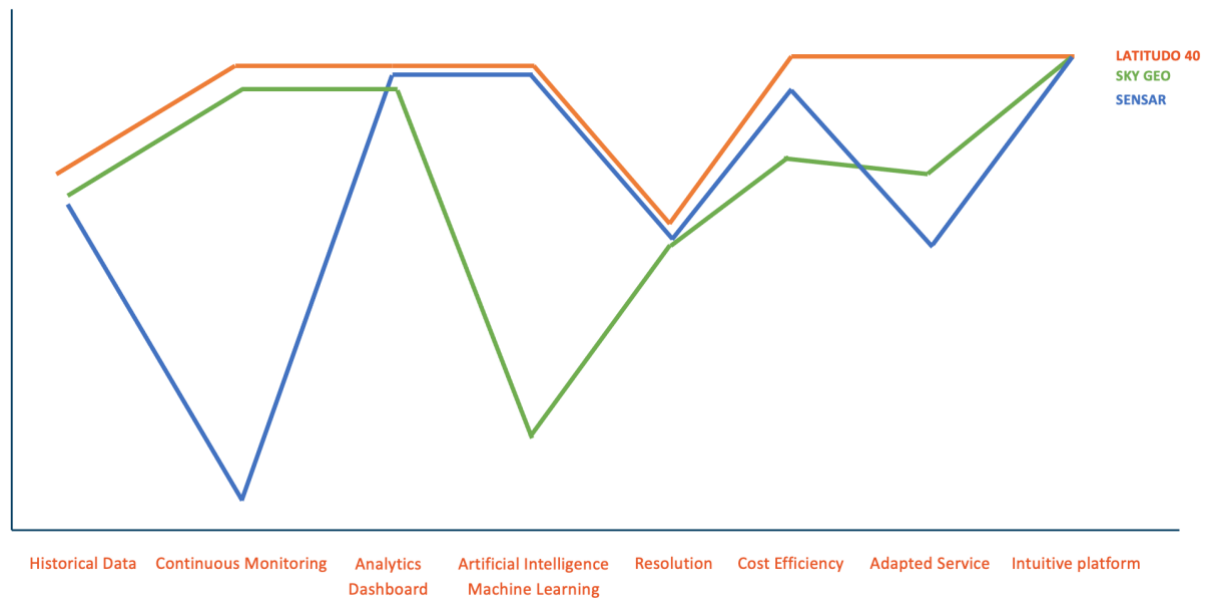


Figure n°9: Marketing Mix, 7Ps.

PRODUCT: Buildings Health Monitoring service adapted to Amsterdam needs with sea elevation and piles materials surveillance.		
PRICE	PLACE	PROCESS
First 3 months free.	Netherlands.	Intuitive platform.
Around €3000 and €4000 per month.	Amsterdam.	Consulting services.
Price depends on the city size and specific services provided (service adaptation to the market).		Customer service.
		High availability of the experts.
PEOPLE	PROMOTION	PHYSICAL EVIDENCE
Mr. Mauro Manente for the go-to-market strategy.	Latitudo 40 website (case studies, videos, interview).	Latitudo 40 website.
Marketing Team 4 people.	Advertising (social media, marketing agency).	Advertising.
Sale employee from Amsterdam.	SEO referencing.	

Figure n°10: Canva Business Model.

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITION	CUSTOMER RELATIONSHIP	CUSTOMER SEGMENTS
Satellite data: Copernicus	Algorithm development	100% automated process	Custom solution adapted to the location and customer need	Construction company
NGO: Milieudefensie	Consumer Service	Historical data since 2016	High variety of services and indicators	Engineering Company
Consulting group: The rock Group	KEY RESSOURCES	50x faster Data analysis	CHANNELS	Amsterdam Smart City Platform
Marketing Agency: Ask Phill	Data & AI	90% lower cost for urban monitoring	Latitudo40 website	Amsterdam city
	Urban Planning Dashboard		Amsterdam Smart City platform	
	Employees knowledge		Consulting companies	
COSTS			REVENUES STREAM	
Employees salaries	Marketing Activities		Service users	
Office rent	IT & Maintenance		Consulting services	
Country fees				

Figure n°11: Timeline of the service' development.

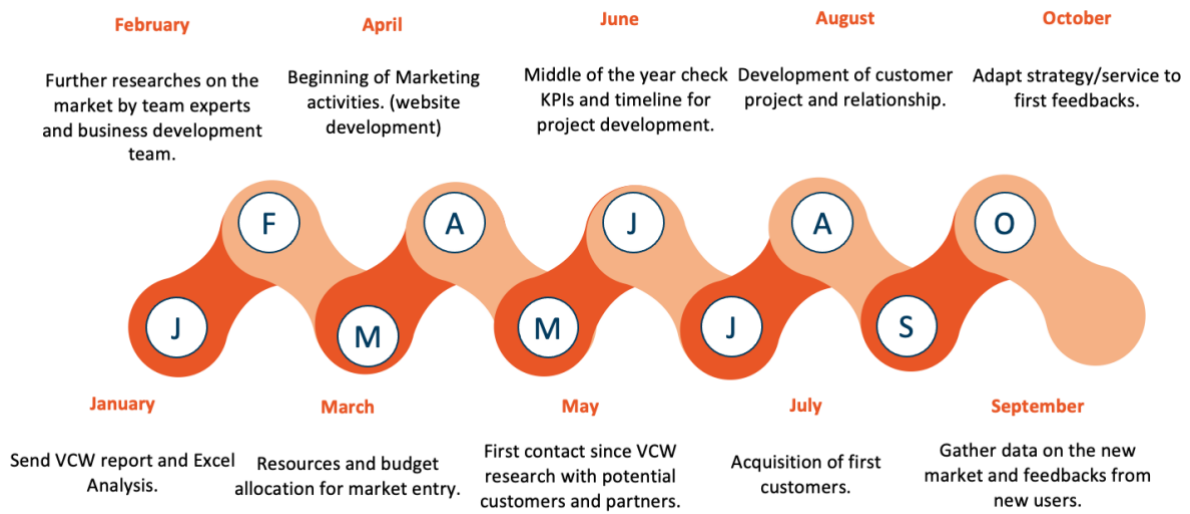


Figure n°12: Key Performance Indicators evolution

	Descriptive KPIs	Reasoning	Term	Achieved
Project Management KPIs	Meetings planned in advance.	To ensure efficient communication and regular feedback, it is important to plan meetings for direct discussions. For less important aspects, a WhatsApp group is used with the field lab team and supervisors, while communication with Latitudo40 is made by email and online meetings.	Medium	✓
	Regular questioning of decisions to make sure to take the good ones.	Plan meeting for KDMs and team members' feedbacks after every phase or big step or the process.	Medium	✓
	Strong involvement of KDM and stakeholders.	Make sure KDM is giving feedbacks. Strong involvement of internal and external Stakeholders.	Medium	✓
	Develop the team to have an employee dedicated to the buildings monitoring service.	The buildings monitoring service is promising and if its implementation in the new market is a success, it could be an opportunity to dedicate one employee to its development/management.	Long	In Progress
Company Development KPIs	Find a promising geographical market	The targeted market must be promising for the future and add value to Latitudo40 as new implantation.	Medium	✓
	Build a stable competitive position in the targeted city	Make sure the service is matching local needs and benefiting to local customers.	Medium	In Progress
	Find at least 3 potential customers in the city	With good service and customer relations, 3 potential customers are enough to make sure Latitudo40 will successfully enter the market.	Medium	✓
	Maximum of 4 direct competitors in the new city	Direct competitors are offering buildings monitoring thanks to satellite technology, if more than 4 are already present in the city, it would be difficult for Latitudo40 to establish a position in the market.	Medium	✓
	Establish solid partnership with 1 company or city council of the targeted city	It will not only allow the company to expand its network but also offer precious knowledge and solid entrance.	Long	In Progress
	Retain customers and support them in their activities	A good relationship with customers will be essential to develop company awareness in the new market.	Long	In Progress
	Expand to other cities in the new targeted country	As we selected a promising geographical market, it will offer the possibility to expand to different cities of this new market.	Long	In Progress