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# The path towards a mobility in the third dimension

How to create  
a National ecosystem  
for Advanced  
Air Mobility

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## FOREWORD

Over the past decade, significant step forwards have been made in technologies applicable to the aviation and automotive industries, enabling the development of advanced vehicles and aircrafts based on hybrid and electric propulsion systems. This has led several players and start-ups to develop drones and new type of vehicles capable of conducting complex operations in the air and in different environments (e.g. urban and rural). The number of these possible applications is continuously growing thanks to the companies and start-ups developing them and all together are creating a new sector commonly known as Advanced Air Mobility (AAM).

With Advanced Air Mobility (AAM) we identify the large family of applications based on manned or unmanned drones and eVTOLs (electrical/hybrid vertical take-off and landing aircraft) that will offer innovative services for passengers and goods transportation, data and images collection and aerial works. This new sector is continuously growing thanks to the great interest coming from both industrial and public entities that recognize the great potential that these applications may

have, disrupting the landscape of our cities and revolutionizing the way we move, bringing urban and intra-urban mobility to the third dimension.

These new services will potentially disrupt the way people move around cities, impacting significantly the urban mobility plans, therefore, there is the need to create solid national ecosystem that are capable of preparing their full scale introduction integrating the regional and local mobility plans, identifying new sets of regulations and requirements to ensure the safety of all citizens and developing required technologies in terms of vehicles, systems and infrastructures. To achieve this objective, coordinating a broad range of interested stakeholders, it is required the definition of a roadmap, a programmatic document that identifies clear steps, activities, responsibilities and targets to be reached over a set period of time. We have successfully supported international clients in their journey to reach such objectives through consolidated steps. These endeavors have resulted in identifying clear lessons learned that are key to the successful definition and implementation of a roadmap for the acceleration of a national ecosystem of Advanced Air Mobility.

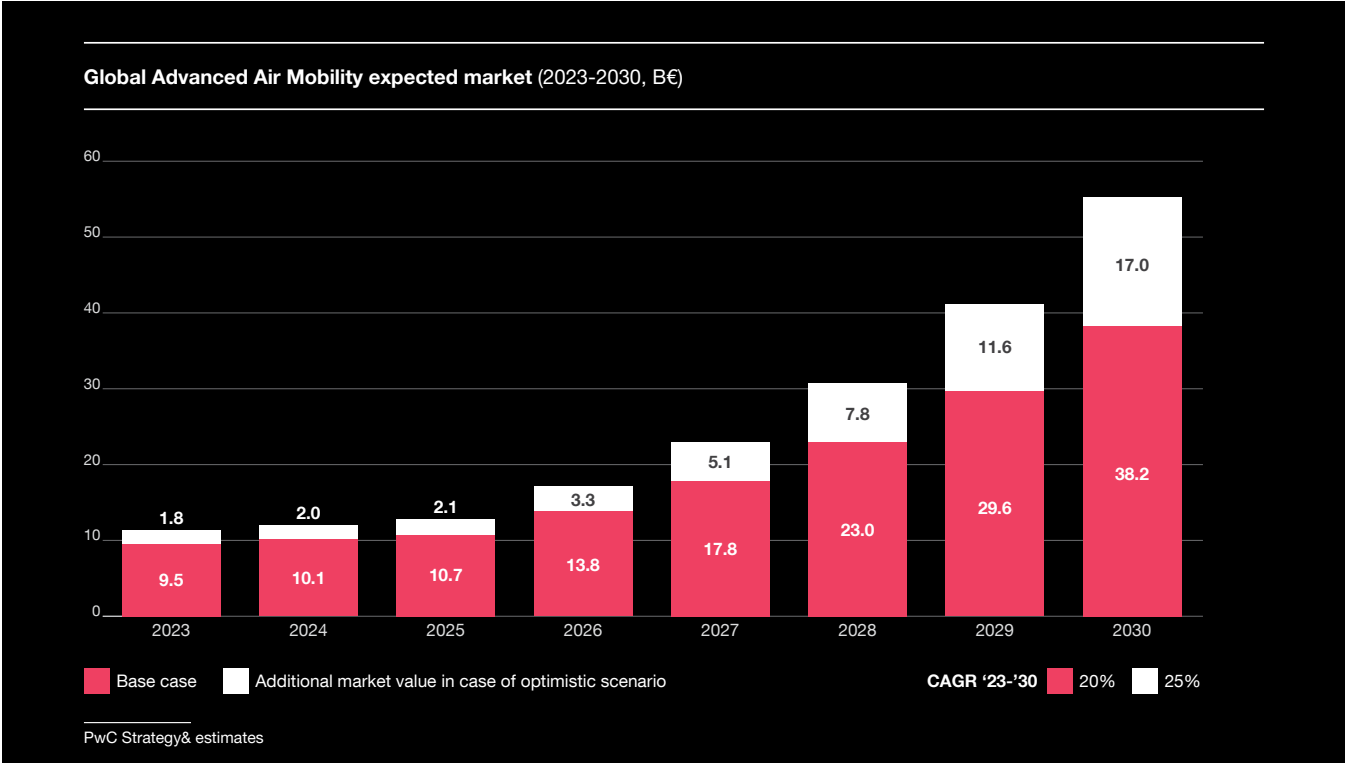
# 1. The current context of Advanced Air Mobility

## 1.1 The Advanced Air Mobility Market

The global Advanced Air Mobility market is expected to witness a significant growth over the 2023-2030 period, thanks to the acceleration of the market for passenger transportation that will see the definition of necessary regulations to enable the full scale commercialization in the second half of the decade. However, there is still no clear definition on how most advanced applications will be enabled based on the fact that current regulations in main countries and regions are still not ready and technologies still need to be refined for the full scale implementation. This brings to the definition of two possible scenarios that have been identified considering different assumptions on the speed of adoption of most complex services (e.g. passenger and goods transportation).

The first scenario, defined as base-case scenario, estimates a 20% CAGR between 2023 and 2030.

More specifically, the period 2023-2025 is expected to experience a 6% CAGR while a 29% CAGR is expected for the 2025-2030 period. Under the base-case scenario the Advanced Air Mobility global market value is expected to grow from 9.5 B€ in 2023 to 10.7 B€ in 2025 and to reach a value of 38.2 B€ in 2030. The second scenario, defined as best-case scenario, is characterized by a 25% CAGR over the 2023-2030 period. The best-case scenario presents the same CAGR as the base-case scenario for the 2023-2025 period (6% CAGR). However, the best-case scenario assumes a higher market value for 2023, equal to 11.3 B€, which should therefore reach 12.8 B€ in 2025. Furthermore, the best-case scenario foresees a steeper growth for the second half of the decade. Indeed, the expected 34% CAGR for the 2025-2030 period should bring the global Advanced Air Mobility market value up to 55.2 B€ in 2030.





According to the United Nations, by 2050 around **88%** of the global population will live in urban areas.

The estimates show how the period 2023-2025 is expected to experience a mild market growth while strong market acceleration should occur between 2025 and 2030 based on the strong impetus that will come from the implementation of passenger services as technologies and regulatory frameworks will be ready to enable these types of higher complexity operations. The European Aviation Safety Agency (EASA) is currently developing the required regulatory framework that will set the basis for the adoption of country-specific regulations by European countries.

According to the United Nations (World Urbanization Prospects The 2018 Revision), by 2050 around 88% of the global population will live in urban areas. Trends of increasing urbanization are expected to further worsen traffic congestion and pollution issues in major cities worldwide. Expected growth of urban population therefore represents a major factor driving demand and pushing for the development of Advanced Air Mobility applications. In this context, Advanced Air Mobility promises to revolutionize inter- and intra-city mobility and transforming the way people and cargo are moved. Advanced Air Mobility solutions would in fact use different spaces from those occupied today by current urban mobility solutions, helping to spread passengers over a larger space, thus reducing traffic. Furthermore, Advanced Air Mobility solutions are expected to rely on the use of sustainable propulsion sources and to reduce journey times with respect to current available options, thus reducing their environmental impact.

The development of the Advanced Air Mobility market is supported by the investments that are being undertaken by the various stakeholder operating in the market, such as technology providers, infrastructure providers and eVTOL manufacturers. These investments are expected to become even more substantial in the upcoming years, contributing to market's growth and demonstrating great interest from international investors.

## 1.2 Perimeter of Advanced Air Mobility applications

Advanced Air Mobility services can be used to respond to a variety of needs adopting different technologies and types of drones and eVTOL aircrafts. Despite the wide range of applications it is possible to categorize them into four main clusters based on the target mission:



### Passenger transportation

Solutions which include a variety of applications, such as air taxis, first aid solutions or entertainment activities.



### Movement of goods

Performed through Unmanned Aerial Vehicles (UAVs) which is particularly useful to perform the last mile deliveries to remote and poorly connected areas and in support to the delivery of medical equipment, with first examples during the COVID-19 pandemic.



### Images and data acquisition

With the aim of inspecting and monitoring infrastructures and sites as well as mapping and surveying of areas such as agricultural fields.



### Aerial work

Which foresees the UAVs to physically interact and complete actions with the world around them while in-flight. Major applications of aerial work include performing maintenance activities, collecting objects or carrying out farming activities such as spraying of water or fertilizers over the fields.

### 1.3 The maturity of the Advanced Air Mobility landscape

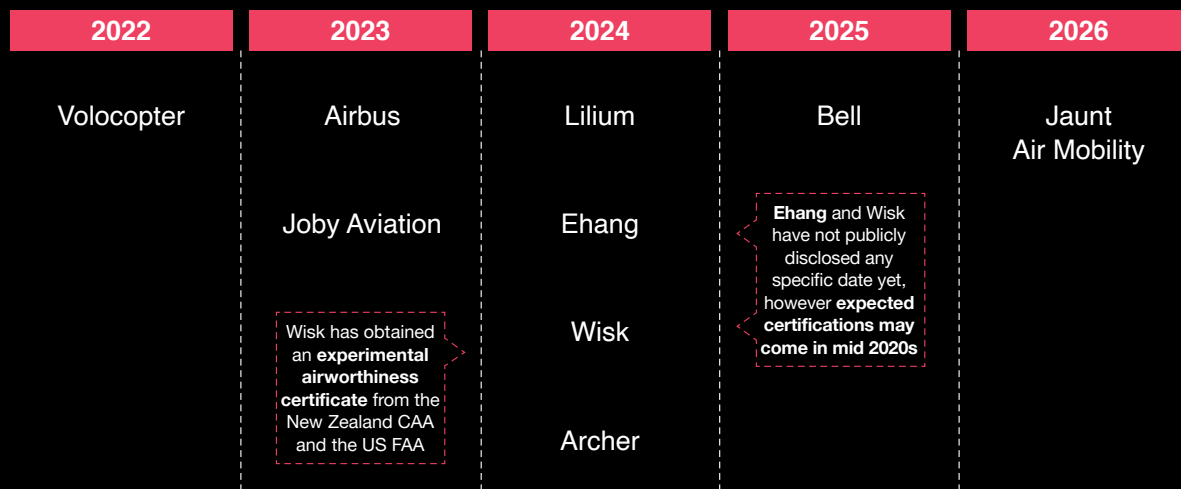
Even though Advanced Air Mobility may still be perceived as something that will take place far into the future, it is useful to know that it may be sooner than we think. Several large industrial players and start-ups are investing to launch innovative services in the next few years, collecting significant investments to support R&D activities to develop cutting-edge vehicles capable of revolutionizing urban mobility and many other sectors.

Indeed, the Advanced Air Mobility competitive landscape is becoming more and more populated by start-ups and large companies that are developing their own eVTOL prototypes. Many of them are expected to obtain certification in the next 2-3 years and to be commercialized shortly afterwards.

Along with the development of drones and eVTOLs, the ecosystems that are required for the implementation of Advanced Air Mobility are also growing rapidly in many countries and geographies around the globe. As

shown in the **figure on page 7** (*Number of initiatives promoting Advanced Air Mobility worldwide*), major geographies are investing resources in supporting a great variety of initiatives and projects with the aim of supporting the development of the ecosystems and the deployment of services. These initiatives are aimed at developing a flexible and effective regulatory framework to govern the adoption of Advanced Air Mobility services, developing an adequate infrastructure network for Advanced Air Mobility, enhancing public acceptance, developing new cutting edge Advanced Air Mobility-related technologies and raising adequate funding to support the development of an effective Advanced Air Mobility system. Based on our analysis, over 140 initiatives related to the development of Advanced Air Mobility applications, systems and services have been identified worldwide, a number that is expected to continue increasing as additional countries and companies are approaching this sector attracted by the great potentiality it has.

Expected certification year for main Advanced Air Mobility players

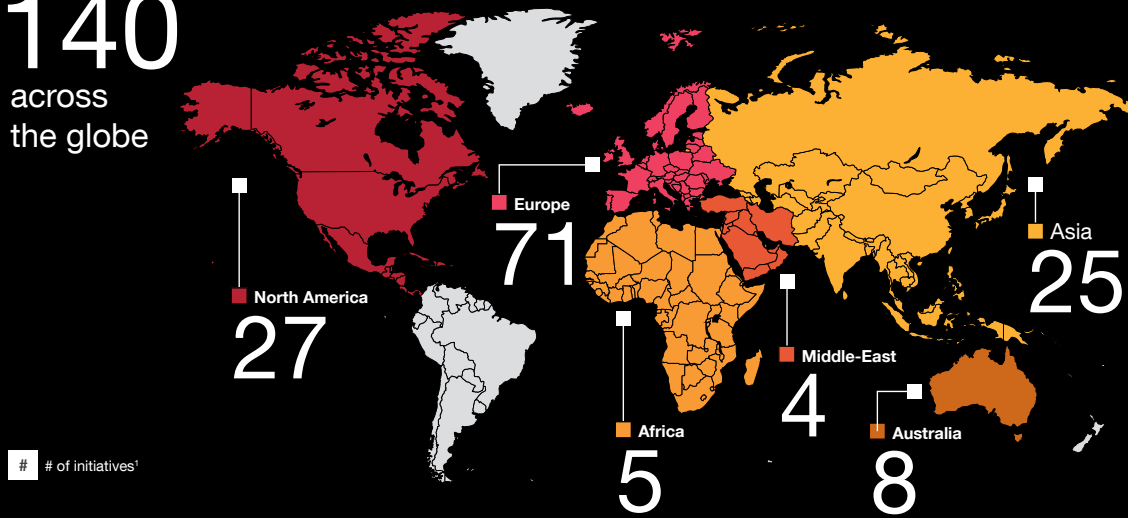


Source: PwC Strategy& analysis based on publicly available information



Number of initiatives promoting Advanced Air Mobility worldwide

140  
across  
the globe



# # of initiatives<sup>1</sup>

Notes: 1) Does not include initiatives purely aimed at prototypes or vehicle development. Source: PwC Strategy& analysis



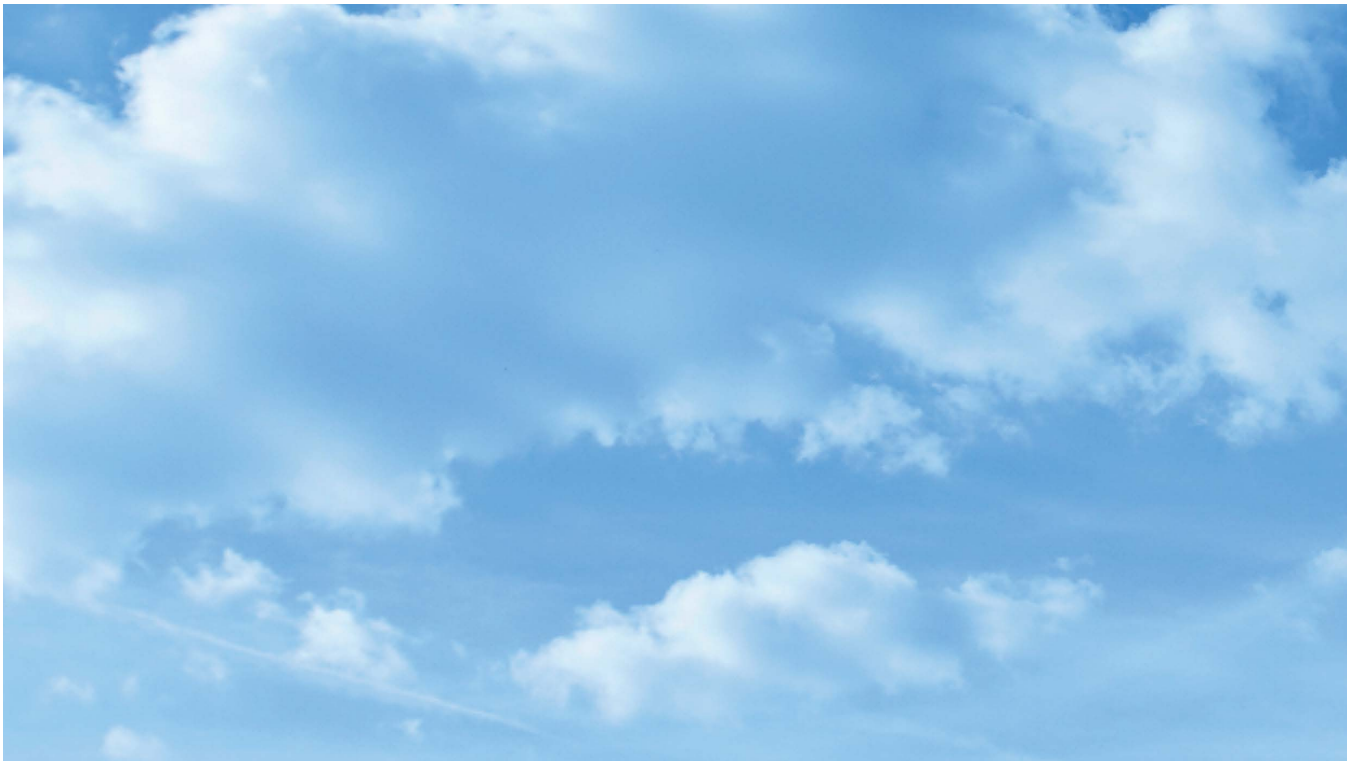
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## 2. Why developing a National Roadmap for Advanced Air Mobility?

Advanced Air Mobility applications will revolutionize the landscape of future urban and extra-urban environments, bringing mobility in the third dimension. This will be possible only with a radical technological innovation in many areas and a complete change in the way cities develop their mobility plans, integrating ground and air transportation in complete safety. National Governments and companies will have to work together to be able to size the opportunities that Advanced Air Mobility could bring and several actions need to be undertaken by the many stakeholders involved in this change, starting from regulators, local governments, industrial players, airspace service providers and infrastructure operators who all together will need to cooperate to design the mobility of tomorrow.

To do so, a programmatic approach has to be put in place, defining the strategic direction to be taken, the key objectives to be targeted, the actions to be put in place and the pillars that should guide them. A National Roadmap could provide all these elements, supporting the creation of an ecosystem for Advanced Air Mobility through a set of clear actions to be undertaken by the stakeholders.

A common path coordinated by a shared Roadmap will enable the country to effectively capture all the benefits deriving from a mature AAM ecosystem, such as traffic reduction and lower CO2 emissions.





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## 3. Our approach to accelerate the creation of the Advanced Air Mobility ecosystem

The path towards the creation of a solid and mature ecosystem capable of enabling all kinds of drone-based applications in different environments requires a coordinated effort of multiple entities that can bring specific competences and know-how. As demonstrated by international experiences, to accelerate the ecosystem several actions need to be put in place to raise awareness on such an innovative topic, boost the engagement of stakeholders and create a cooperative environment, where innovation is the key pillar around which all activities revolve.

To achieve such a challenging but, at the same time, rewarding goal, we have identified and tried out a set of key steps to be undertaken by the whole ecosystem's components:

- **Involvement of ecosystem's future stakeholders;**
- **Definition of a framework of analysis;**
- **Identification of specific needs and prioritization of target applications;**
- **Identification of key gaps and challenges for the realization of the ecosystem.**

Each step, if taken correctly by involving all competencies required, will build us the basis for the definition of a Roadmap of actions that will address the identified gaps and challenges, thus unlocking all target applications strategic for a country or region.



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### 3.1 Involvement of ecosystem's future stakeholders

As a first step, it is crucial to be able to bring onboard all the stakeholders that will have a role in the upcoming sector of the Advanced Air Mobility, by creating working groups where different competencies and experiences can be mixed together to reach the desired goals. To let the journey begin, key national stakeholders such as regulators, national institutions or major industry players should cooperate in creating an open environment where working groups can flourish and be supported.

The signing of Memorandum of Understandings among industry and public authorities has proven to be a crucial factor that can raise the interest towards the topic and boost the participation of national and international stakeholders. It is a signal for interested parties to start promoting a collaboration among players that has proven to be the key to success.



We have identified eight major categories of stakeholders, that should be represented in the working groups, to enhance the presence of key capabilities, required to create a framework of analysis and, subsequently, investigate gaps and challenges and related actions to overcome them:

- **Regulators** are asked to create a favorable regulatory framework for research and testing activities to develop required technologies;
- **National institutions** to provide necessary support in terms of resources and coordination of activities, in line with national strategic goals;
- **Regional/local institutions** can identify specific needs to be addressed at first, suggesting the direction to be followed in the development of technologies and applications;
- **Industry players and start-ups** need to develop required technologies and competencies that are necessary for the flourishing of strategic applications;
- **Agencies and research centers** that can support industry players and regulators in developing and testing systems and technologies;
- **Infrastructure and service operators** need to support in the definition of future services and applications in terms of concept of operations (ConOps) to be able to offer sustainable services for the end users;
- **End users**, including potential client companies, should be included in the definition of the services ensuring that upcoming applications can actually fulfill existent needs;
- **Communities and associations** will investigate main concerns, supporting in the definition of the right actions to address them enhancing a full acceptance of Advanced Air Mobility applications by all impacted stakeholders.

The variety of actors composing the working groups is the key element that needs to be tackled right at the beginning, to ensure that the following steps are made correctly and results are shared and supported by the future stakeholders that will compose the ecosystem.

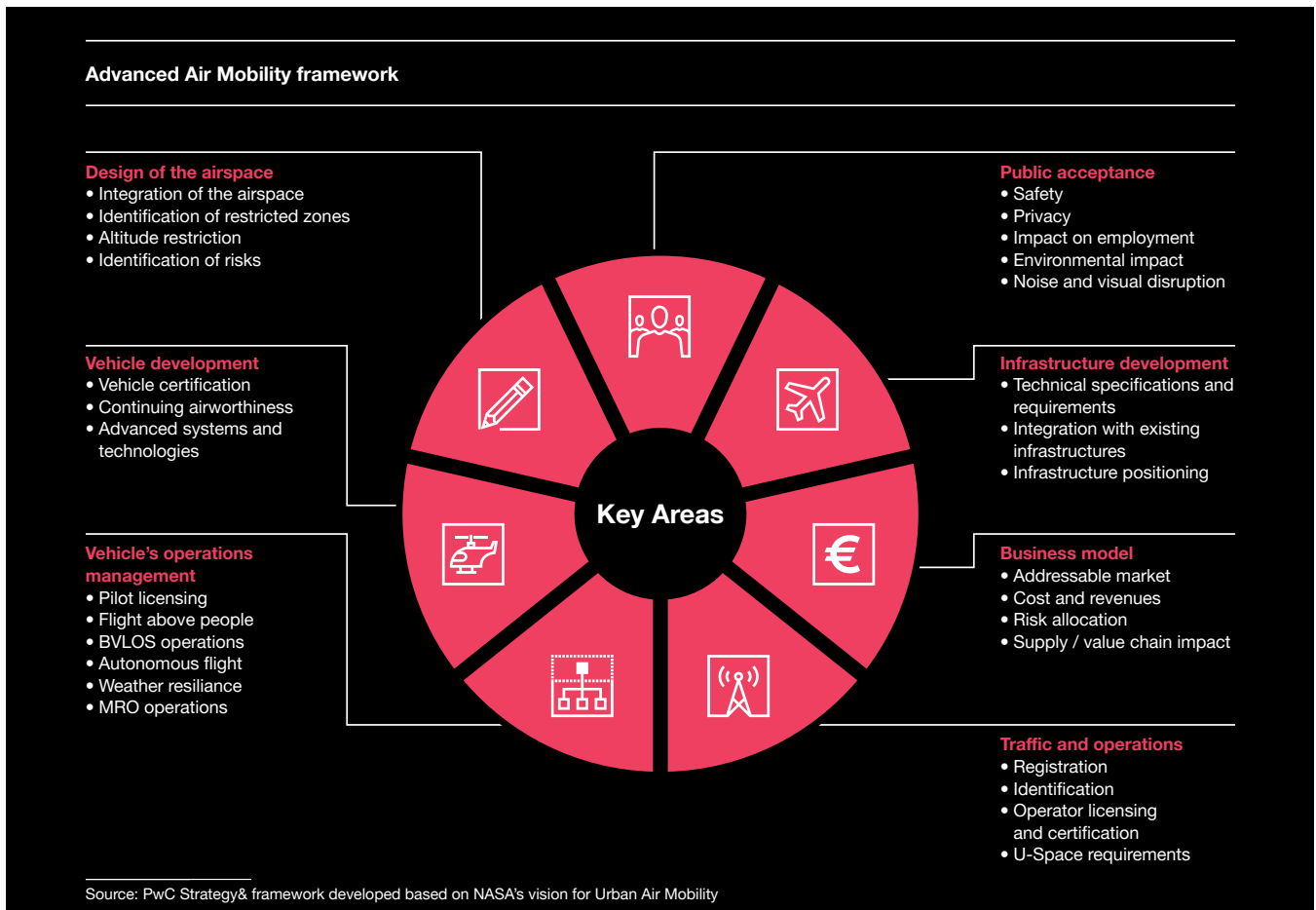
### 3.2 Definition of a framework of analysis

The second step requires the definition of a framework of analysis. This element is fundamental to correctly define the area on which the working groups will have to at first investigate and define gaps and challenges and then identify the set of actions to address them.

It is possible to adopt a complete framework that provides a 360-degree view on what elements need to be developed by identifying seven key areas. Conducting analysis along these areas will ensure a full comprehension of the actions that need to be undertaken to reach a full maturity of the ecosystem, enabling the deployment of all types of applications. In addition, for each area, specific key topics have been furtherly detailed, in order to guide the analysis and the definition of the gaps to be fulfilled.

To conduct the required analysis, working groups need to be set up for each area of the framework, involving target stakeholders, capable of bringing know-how and competencies based on the matter analyzed. This will lead to the formation of heterogeneous groups where the coexistence of multiple actors with different backgrounds can favor the creation of innovative ideas and the identification of key elements to be addressed.

This framework gives not only a high-level view of the whole aspects composing the ecosystem of Advanced Air Mobility, but it also provides the elements to be tailored for ad hoc analysis of specific Advanced Air Mobility applications.



### 3.3 Identification of needs and prioritization of target applications

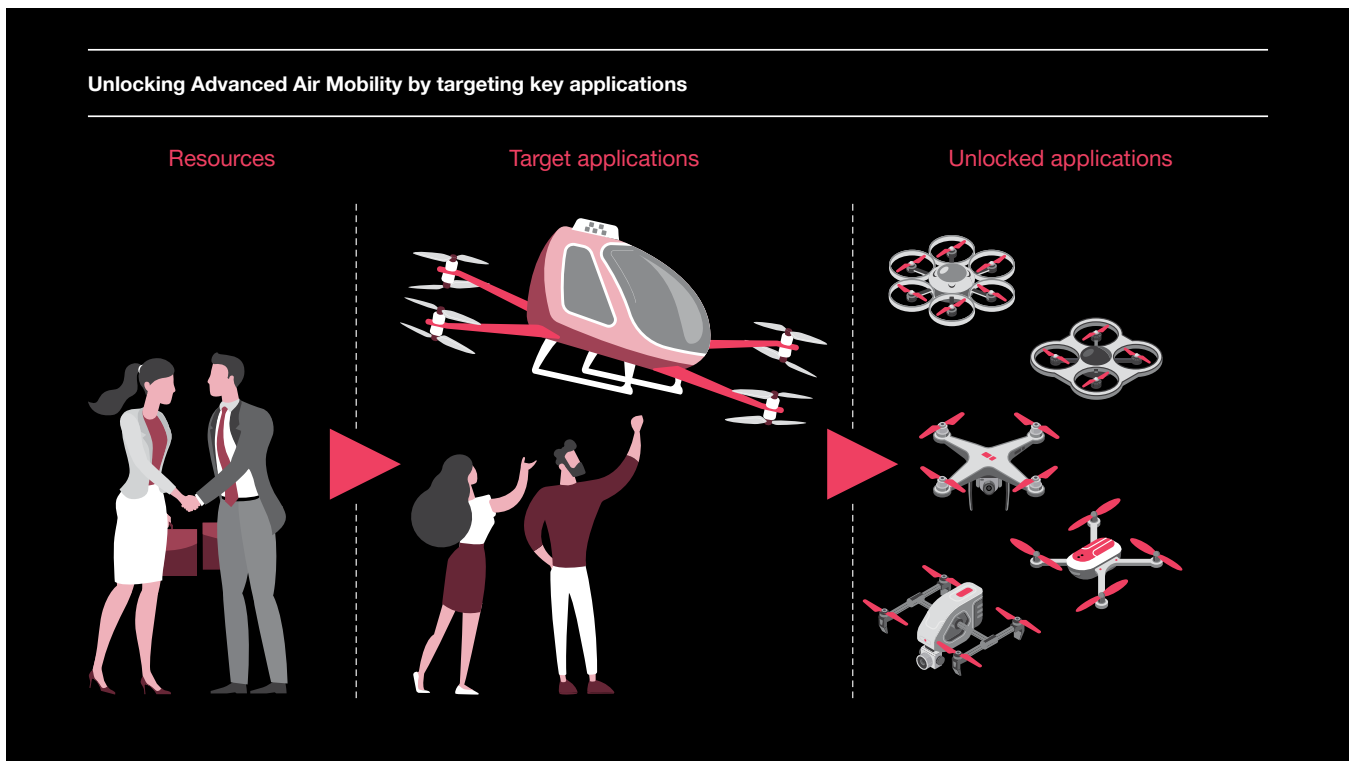
The focus of a National Roadmap is to develop the entire Advanced Air Mobility ecosystem, unlocking all kinds of drone-based applications (e.g. air taxi, air delivery, inspection, monitoring and mapping, etc.). However, to be able to achieve this goal, it may be sufficient to target certain specific applications that together can address all gaps and challenges that will be identified by the working groups along the framework defined. This ensures the possibility to concentrate resources only on a few key strategic applications, without trying to address too many types of applications and losing grip on the actual needs.

Therefore, for this step it is crucial the involvement of specific actors to analyze and identify specific needs to be targeted and consequently select the applications that are capable of satisfying those needs. A central role now is played by local and regional institutions that more than anyone are aware of which type of needs citizens may have and therefore can provide their input guiding the definition of the strategy for the creation of the ecosystem. For instance, many cities are now facing the challenge of

reducing traffic and carbon footprint. These issues can be tackled thanks to the implementation of urban / intra-urban passenger transportation services that thanks to the deployment of eVTOLs can significantly reduce CO2 emissions at an urban level.

Furthermore, the role of cities can be complemented by the involvement of end users' representatives that can advocate the needs that final users of Advanced Air Mobility services may have and the best way to structure services that can effectively address those needs.

The combination of multiple perspectives will bring to the definition of key strategic pillars on which the selection of the target applications should be based. Pillars will guide the decision process and will provide support also in the definition of the strategic vision at the basis of the action composing the Roadmap. As a consequence, pillars have to be tailored to fit not only the identified needs but also the overall strategic plan that each country or region has set, combining a series of objectives that all together link the development of the Advanced Air Mobility ecosystem to the overall national plan.





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### 3.4 Identification of key gaps and challenges for the realization of the ecosystem

Once the previous steps are complete, everything is in place for the investigation of the roadblocks that need to be overcome to bring to full maturity the whole ecosystem. To do so, for each area composing the Advanced Air Mobility framework, a working group, composed by relevant stakeholders that would bring value to the analysis based on their competencies and past experiences, needs to be set up to work towards the definition of the specific gaps and challenges. Each group will meet during a series of working sessions where each participant can bring its contribution to the discussion supporting the group's research activity.

As a result, the groups will have collected a longlist of roadblocks for the creation of the ecosystem that now have to be addressed by a set of actions that need to be defined. Each action has to be characterized in terms of activities to be carried out, timeline, actors involved and financial resources required. This will result in a set of actions that can be categorized in four clusters based on the activities to be performed, the final goal to be reached and the actors that will be involved. These clusters are:

- **Assessment studies** which includes activities aimed at exploring and studying complex topics to support the definition of operations characteristics, requirements and guidelines;
- **Research & development** which includes activities conducted to develop technologies and platforms to be applied to vehicles and supporting systems;
- **Regulation** which includes activities aimed at supporting the definition of regulations on vehicles, systems, airspace and infrastructures;
- **Communication** which includes communication activities aimed at enhancing public acceptance and communicating benefits deriving from Advanced Air Mobility and addressing concerns.

All the activities belonging to these four clusters will then need to be allocated over a specific period of time in order to be able to reach the target maturity levels set for the ecosystem and be able to introduce the selected applications and services. These activities combined together will create the Roadmap for Advanced Air Mobility that will have the goal to fill the gaps identified, developing required technologies, regulations and systems that are the key enabler of all possible Advanced Air Mobility applications.



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## 4. Key takeaways and lessons learned

The creation of a national roadmap is no easy task and requires constant commitment from key figures that can coordinate and manage the activities that need to be set in place. As seen, to do so, Strategy& has identified five key success factors to effectively design and implement a strategy based on a roadmap that can accelerate and bring to life a national ecosystem for Advanced Air Mobility.

**1.**

Creation of momentum among stakeholders setting up groups of work to discuss Advanced Air Mobility challenges and opportunities.

**2.**

Involvement of local and regional authorities in the definition of communities' needs.

**3.**

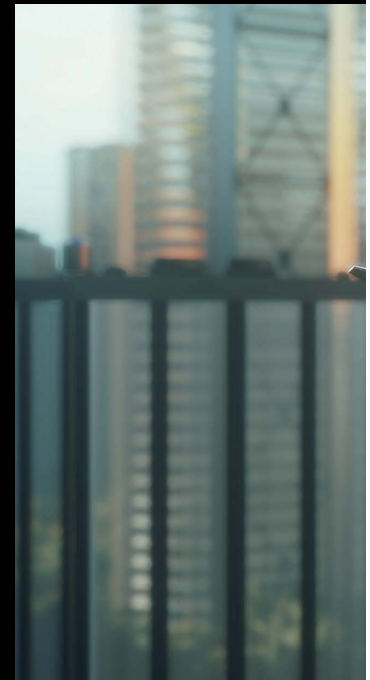
Development of a framework to identify areas of intervention.

**4.**

Identification of clear needs and applications capable of fulfilling them.

**5.**

Definition of activities addressing key roadblocks, both regulatory and technological, to the introduction of Advanced Air Mobility.



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