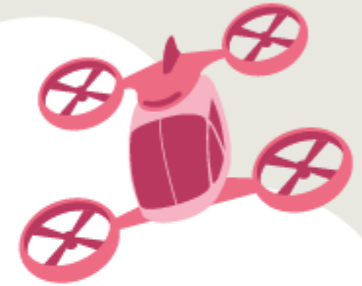




FLUGTAXIS IN DER RHEIN-MAIN-REGION

Elevating Urban Mobility: Il progetto FLAMINGO e il futuro dei taxi aerei per la mobilità regionale



18 September 2024, Next Generation Mobility

Conferenza Nazionale sull'Urban Air Mobility e Advanced Air Mobility

d-fine



Digital Ventures



Skyports
INFRASTRUCTURE



Gefördert durch:



Bundesministerium
für Digitales
und Verkehr

aufgrund eines Beschlusses
des Deutschen Bundestages

Agenda

01 Introduction

02 Data- and model-based approach

03 Results and recommendations

For more than 20 years, d-fine has been providing solutions to complex problems for customers in various industries

Who am I



Dr Lisa Löbling

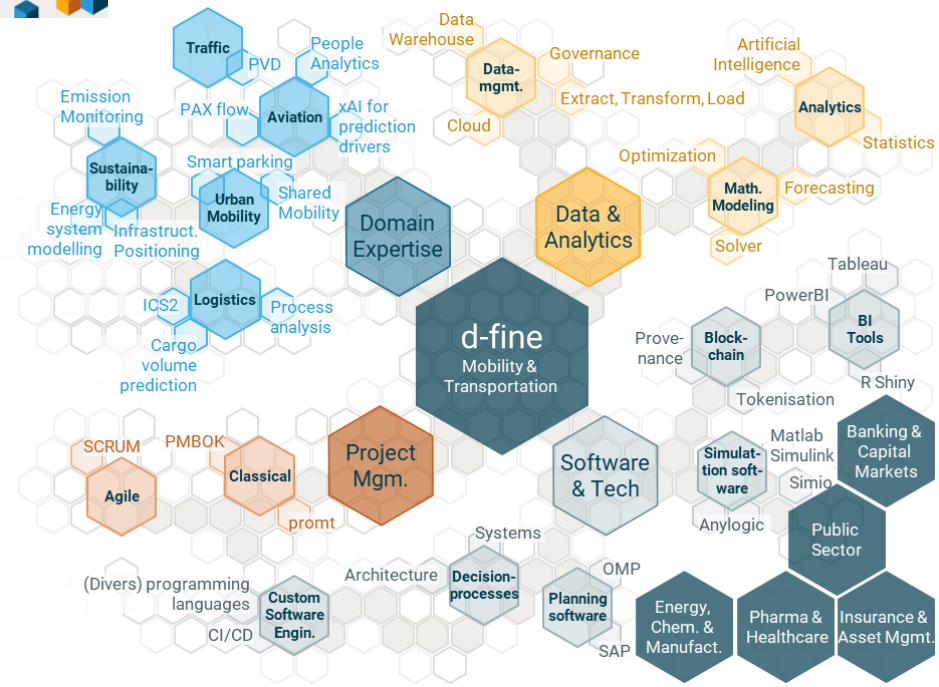
- Manager at d-fine
- Expert for business case analysis and data analytics in logistics and sustainable mobility
- M.Sc. and PhD in Physics, MBA Candidate



- Banking & Capital Markets
- Insurance & Asset Management
- Chemicals, Energy & Manufacturing
- Pharma & Healthcare
- Mobility & Transportation
- Public Sector

defining d-fine

1.500+ Employees
>85 % STEM Background
2.000+ Successful projects



Elevating Urban Mobility:
Il progetto
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▶ Together with our clients, we drive strategies, develop business designs and implement tailored IT solutions. A collaborative and trustworthy relationship is important to us.

01 - The project consortium and motivation

What is the potential of an air taxi service in the Rhine-Main region?

The FLAMINGO project is investigating the feasibility of an AAM network in the Rhine-Main region.

THE MOTIVATION



In terms of **technology** and **regulation**, air taxis are close to commercial implementation



The Rhine-Main region is a **transport hub** throughout Germany and Europe



There is no **blueprint** for socially and economically sustainable implementation



An air taxi service can potentially deliver **added value** for **stakeholders** in the Rhine-Main area

Gefördert durch:



aufgrund eines Beschlusses des Deutschen Bundestages

Project partner:



Associated project partners:



Skyports



STADT FRANKFURT AM MAIN

THE KEY QUESTIONS



What are potential user groups for an air taxi service?



For which **routes** is an air taxi service in the region advantageous?



What is the **willingness to pay** for such a service?



What are suitable initial **operating models and services**?



How does a **potential ramp-up of an AAM network** look like?



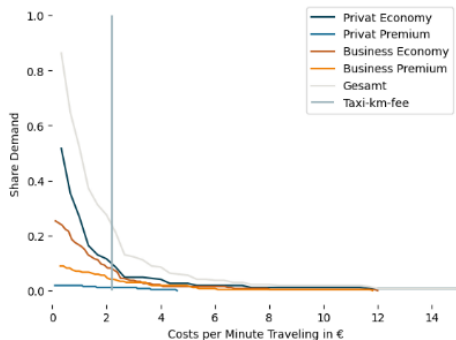
How does this fit into a **regulatory and social framework**?

The project uses scientific methods such as survey statistics, the development of scoring models and economic analyses



Survey & Statistics

- Analysis of user groups via a socio-economic survey online and at the airport
- Statistical analysis of the results



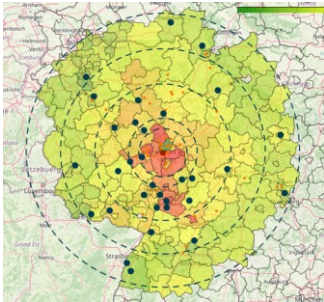
Inverse demand function - share of demand compared to the price per travel minute in EUR



Deep Dive

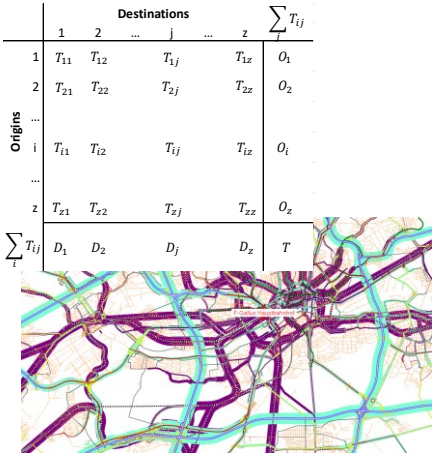
Data processing & analysis

- Socio-economic evaluation to identify regions of interest
- Distinction of user groups and use cases
- Data processing and graphical representation



Traffic modelling

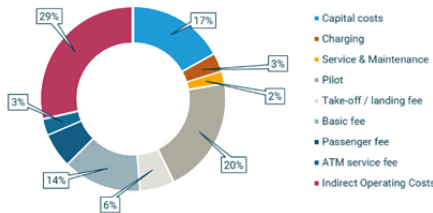
- Demand modelling based on real data
- Use of the latest tools
- Integration of AAM: Trip generation, distribution, travel mode choice and route assignment



Deep Dive

Economic efficiency & Scenario analysis

- Cash flow analysis of an air taxi and vertiport business
- Application of industry-standard methods
- Modelling of ramp-up scenarios



Data-driven and quantitative approaches are the key to understanding and for analysing complex problems.

A good understanding of the user groups and their requirements for AAM is necessary for the evaluation of potential business cases

Deep Dive

CATEGORISE

Distinguish different user groups based on the survey data, literature research and expert interviews



UNDERSTAND

Identification of regional KPIs marking the threshold of use and measuring interest



ASSESS

Create reliable and reasonable scoring system to rank regions overall personas



PREMIUM
TOURIST

Focuses on **comfort and good travel experiences**. Travel time savings are secondary.



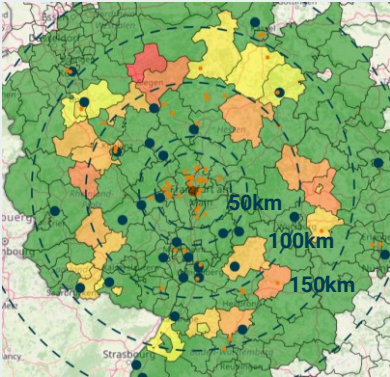
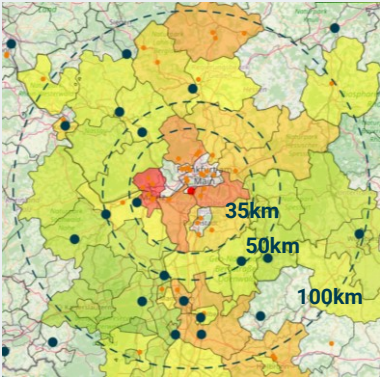
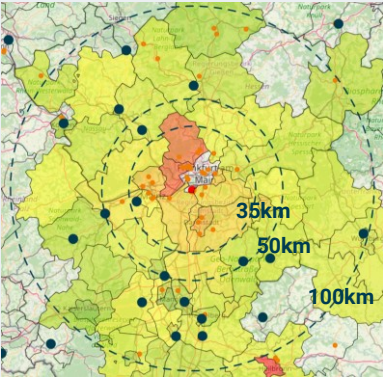
BUSINESS
TRAVELLER

Reliability and travel time savings are the priority.



POORLY
CONNECTED

FRA airport connection "established". **AAM as part of the premium flight journey.**



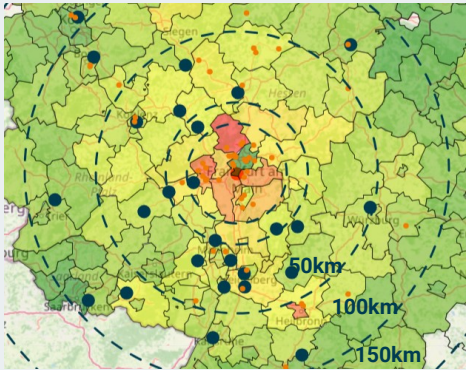
● Frankfurt Airport

● Company locations

● Regional airport

Σ TOTAL SCORE

1. List of relevant KPIs per persona
2. Normalization of KPIs to 0 – 100
3. $Score_{\text{persona}} = \sum_{i \in KPI} Coef_i \times KPI_i$
4. $Score_{\text{Total}} = \sum_{j \in Personas} Score_j \times Share_j$



USE CASES



Regional
airport



Company
shuttle



"Hinterland
connection"

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03 - Deep dive –
Scoring

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A region-independent tool for evaluating AAM networks was developed as part of the economic feasibility analysis

Deep Dive

Assumptions

Vertiport/ Air taxi data:

- Staff salaries
- Power consumption
- Technical specifications
- Investment costs

from: industry stakeholders

Scenarios

Modelling:

- Air traffic controls
- Autonomous flight

Ramp up/Utilization

Ramp up parameters:

- Number and types of air taxis
- Number and types of vertiports/-hubs
- Routes/ vertiport locations

Utilization:

- Demand PAX per route per year (demand price elastic)
- Flights per route per year

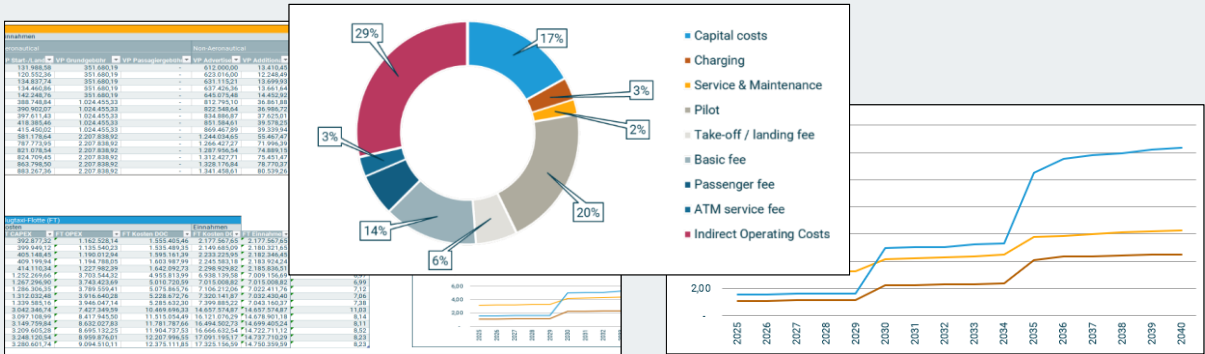
Data-Input

Cashflow model:

- Expenses /year 2027 up to 2042
- Revenues/year 2027 up to 2042

Analysis:

- Cost distribution per route or per flight
- Price per km

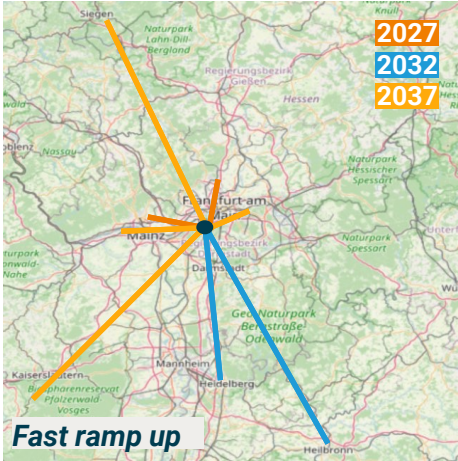


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04 - Deep dive –
Economic evaluation

Based on the demand modeling, two ramp-up scenarios were defined by a selection of routes, vertiport types and air taxi fleet sizes

	Slow ramp up			Fast ramp up		
2027	Wiesbaden	3 Velocity		Wiesbaden	6 Velocity	
				Bad Homburg	3 Velocity	
2032	Wiesbaden	3 Velocity		Wiesbaden	6 Velocity	
	Bad Homburg	3 Velocity		Bad Homburg	6 Velocity	
	Heilbronn	3 Lilium Jet		Heilbronn	3 Lilium Jet	
2037	Wiesbaden	6 Velocity		Wiesbaden	8 Velocity	
	Bad Homburg	6 Velocity		Bad Homburg	8 Velocity	
	Heilbronn	6 Lilium Jet		Heilbronn	8 Lilium Jet	
	Heidelberg	3 Lilium Jet		Heidelberg	8 Lilium Jet	
	Siegen	3 Joby S4		Siegen	3 Joby S4	
				Bingen	3 Joby S4	
				Hanau	3 Velocity	
				Cluster Südwestpfalz	3 Lilium Jet	
	2027	2032	2037	2027	2032	2037
Price/km/PAX	12€	4€	3,50€	10,50€	3,50€	2,50€
Price/km	12€	10,50€	10,50€	10,50€	9,50€	9€
Base fare/ Flight	30€	21€	26€	4€	10€	8€



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05 - Deep dive –
Ramp-up scenarios

To evaluate the main uncertainties in our economic model, a sensitivity analysis is carried out and recommendations for actions are derived

Uncertainties

- Uncertainty factors are deliberately varied
- Promoting or inhibiting developments in regulation and technology are introduced

> Quantify the influence on the development of the AAM network in the Rhine-Main Region.



Air traffic controls



Trip frequency and utilization



Autonomous flight



Capital costs eVTOLs



Indirect Operating Costs (IOC)



Fraction of empty flights

Key Factors and Recommendations

- Regulatory **standards**
- Information on **eVTOL pricing** strategy
- High **capacity utilization**



Connecting companies and municipalities with AAM stakeholders



Leveraging existing infrastructure in the regional airport use case



Tackling high initial costs by state funding or collaborations



Certification standards, autonomous flight, maximizing capacity utilization, and connecting potential stakeholders are all key factors in the economically viable development of AAM in the Rhine Main region.

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analytical. quantitative. tech.