



Prioritising municipal photovoltaic initiatives using multi-criteria decision analysis

PHD PROGRAMME IN ENGINEERING AND MANAGEMENT

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Background

- Concerns about climate change, its dire consequences, and the rising demand for energy have resulted in a significant increase in the utilisation of Renewable Energy Sources
- Active involvement of municipalities and citizens is key to sustainable energy planning.

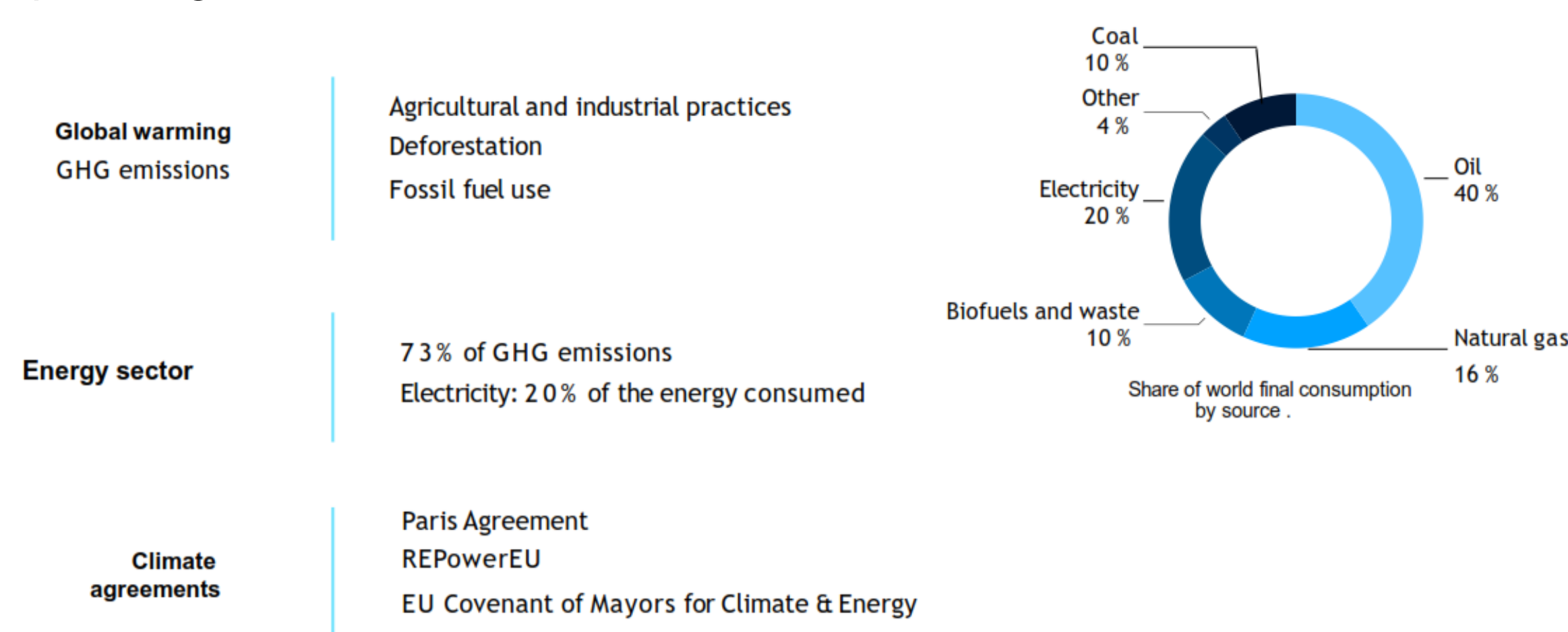


Fig 1: Global Warming and the Energy Sector's Emissions Share

Objectives

- Design of a robust Multicriteria Decision Analysis (MCDA) model to reduce municipality Green House Gases (GHG)
- Apply the proposed framework to the Spanish municipality of Rajadell
- Classify the photovoltaic (PV) initiatives according to their urgency of implementation
- Provide recommendations for policymakers

Methodological Framework and Model Structuring

- MCDA problems are classified into three categories: choosing, ranking and sorting
- This study addresses a sorting problem, where PV initiatives are categorized based on the urgency of their implementation.
- The ELECTRE Tri Nc family of MCDA methods is utilized in this study
- ELECTRE family of MCDA methods can deal with qualitative performance of scales of criteria
- ELECTRE methods allow consideration of indifference and preference thresholds, making it appropriate to consider imperfect data knowledge and arbitrariness

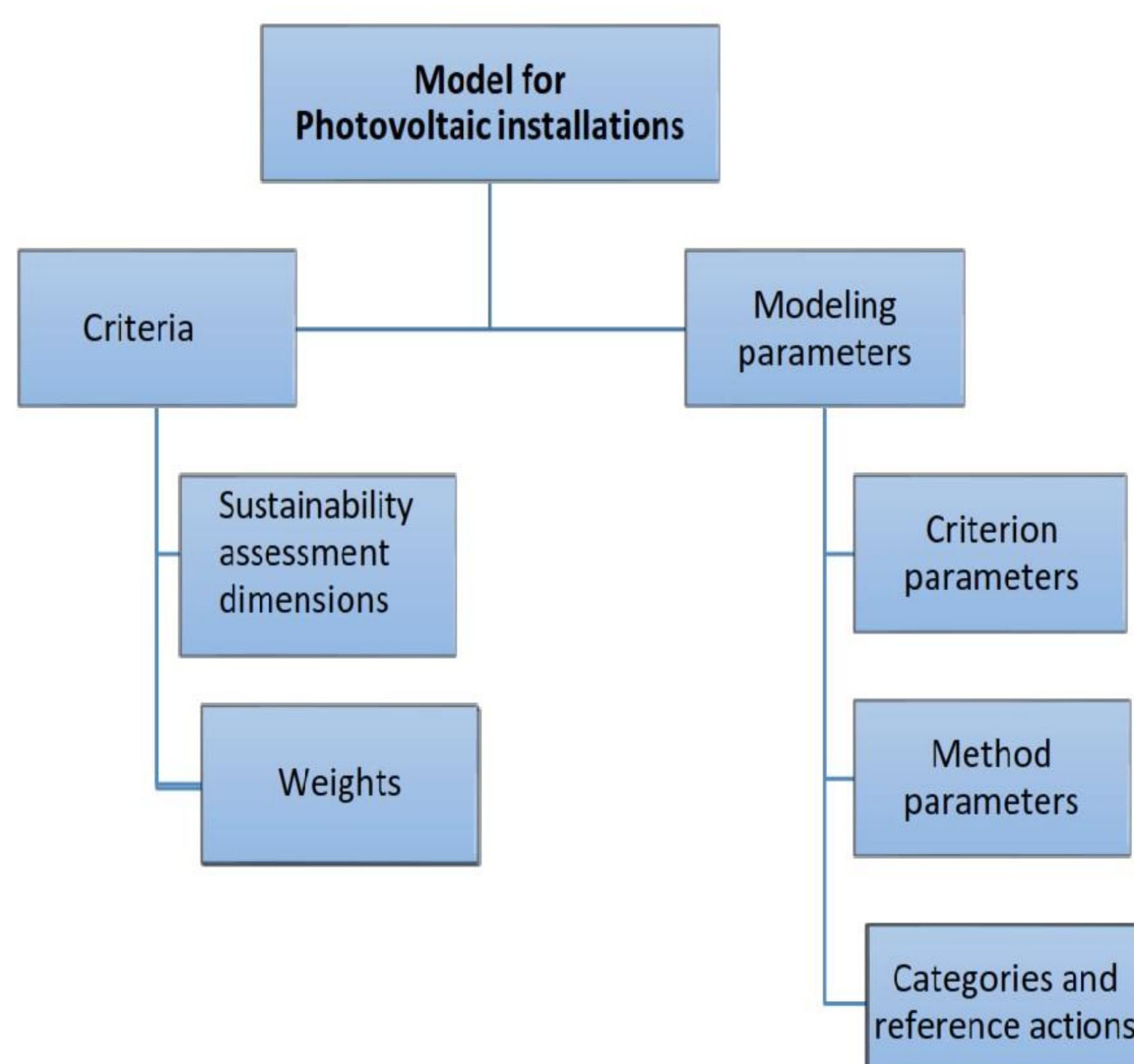


Fig 2: Framework for MCDA Model

Level of Urgency Category (Cq) and Actions under assessment

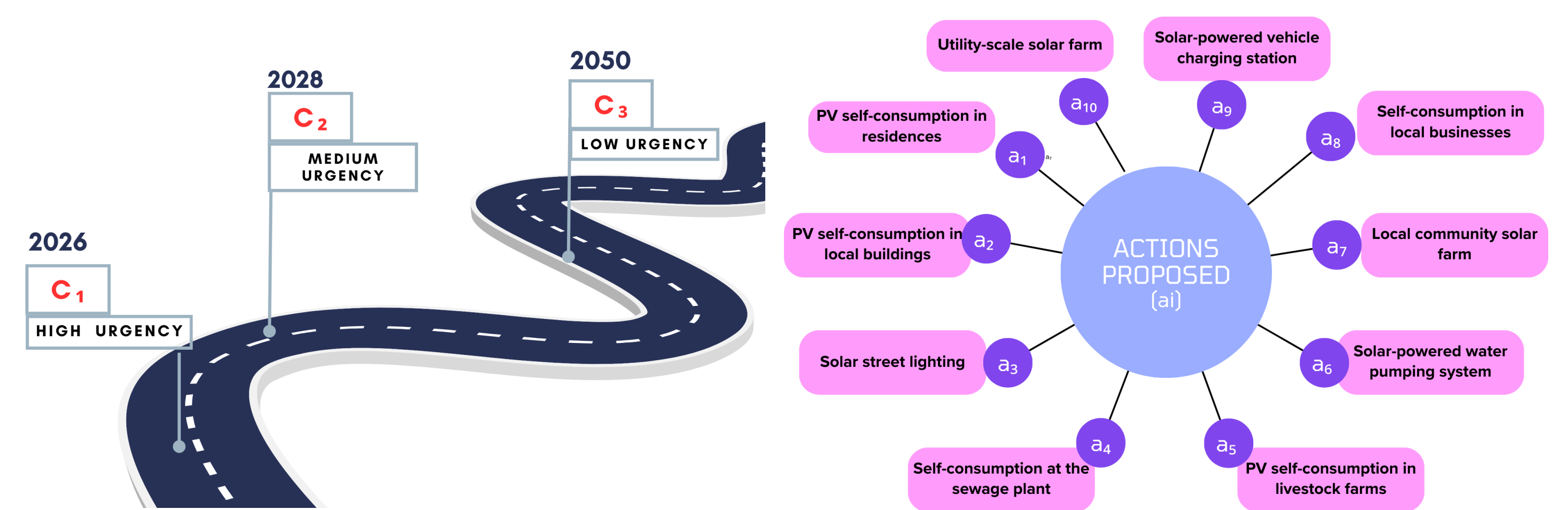


Fig 3: Implementation Category (Cq) and Alternatives Proposed (ai)

Model Results and Timeline Proposal

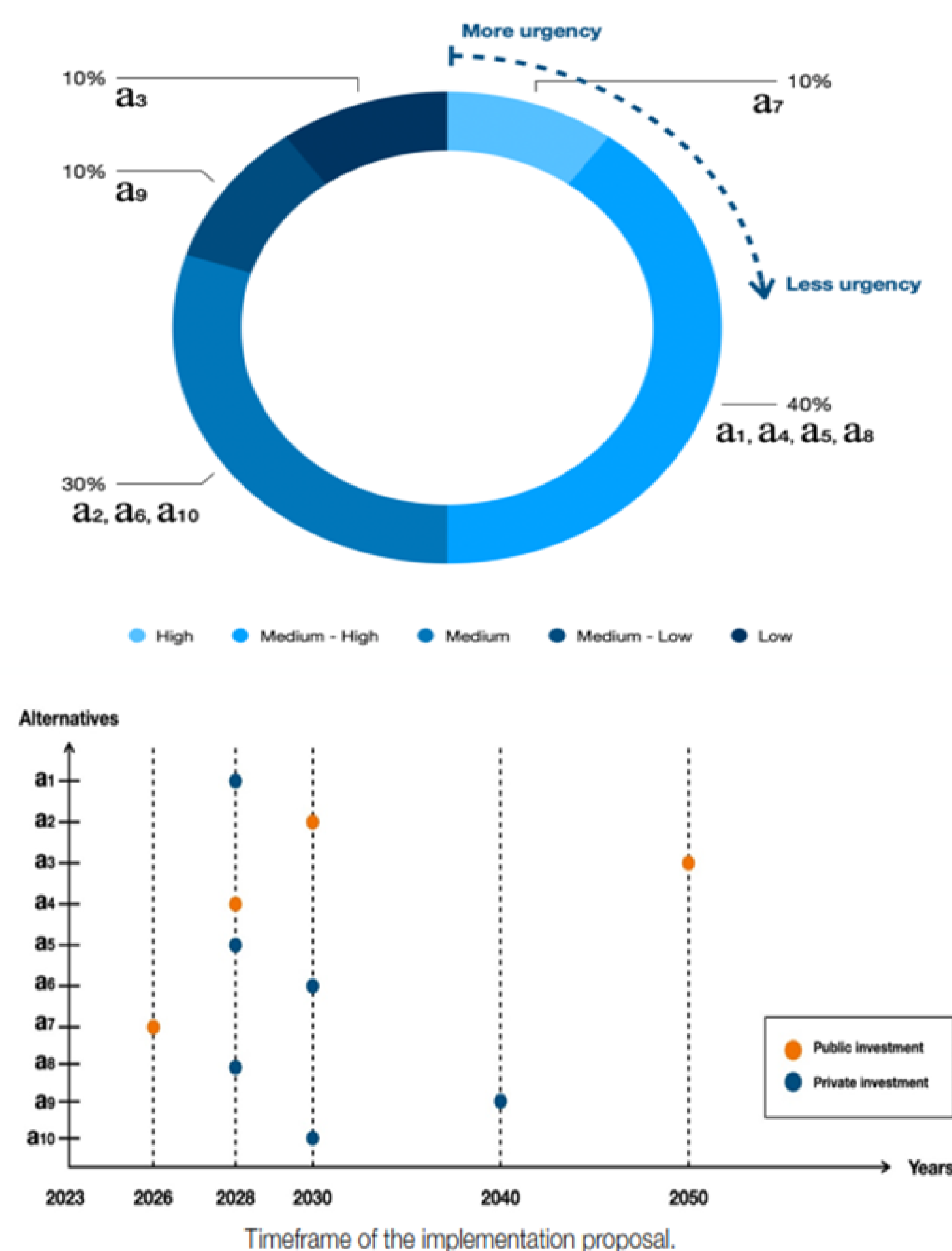


Fig 4: Classification of actions according to their urgency of implementation

Policy Implications

- Implementing the proposed strategies could reduce GHG emissions in the residential and service sectors by 49.11%
- The proposed framework offers valuable support for policy-making, particularly in the development of regulatory actions and public policies for the solar energy sector
- Key insights from the analysis suggest that the current policy approach in Spain should be restructured to reduce its dependence on political factors and refocused to facilitate the energy transition
- The flexibility of the model also means that it can be adapted to different municipalities or policy areas, broadening its utility beyond this case study