Energy Partnership
Energiepartnerschaft
South Africa - Deutschland

mineral resources & energy
Department:
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

An Overview of Energy Efficient Lighting Research in South Africa

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Agenda

- Introduction
- Methodology
- Data Analysis
- Potential gaps in research
- Conclusion

Introduction

- Provide an overview of the current EE lighting energy research being conducted in South Africa
- Support the establishment of an EE lighting energy research platform which will operate in close cooperation with the EE lighting energy industry and service providers in South Africa.
- All energy efficient lighting applications across all sectors have been covered by the research.

Methodology

To achieve this goal, collection of various data of a qualitative nature had been collected.

This included:

- Conducting primary research in the form of questionnaires
- Reviewing secondary research from relevant published research articles

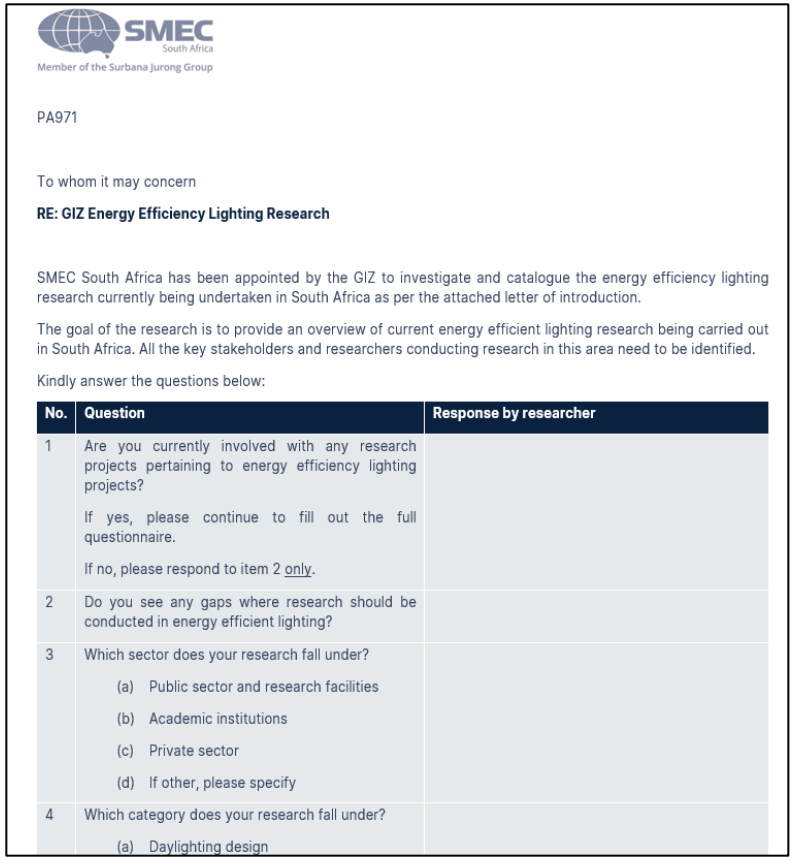
Data collection (Primary)

- Participants for questionnaires were found and selected by contacting all key stakeholders
- South African Universities, South African Universities of Technology, Eskom, the private sector, and other research organisations
- Published research articles - list of references was analysed to further expand the search.
- The main methods of contact to researchers were via:

➢ Emails,

➢ Telephonic discussions, and

➢ Zoom/MS Teams meetings



SMEC South Africa
Member of the Surbana Jurong Group

PA971

To whom it may concern

RE: GIZ Energy Efficiency Lighting Research

SMEC South Africa has been appointed by the GIZ to investigate and catalogue the energy efficiency lighting research currently being undertaken in South Africa as per the attached letter of introduction.

The goal of the research is to provide an overview of current energy efficient lighting research being carried out in South Africa. All the key stakeholders and researchers conducting research in this area need to be identified.

Kindly answer the questions below:

No.	Question	Response by researcher
1	Are you currently involved with any research projects pertaining to energy efficiency lighting projects? If yes, please continue to fill out the full questionnaire. If no, please respond to item 2 only.	
2	Do you see any gaps where research should be conducted in energy efficient lighting?	
3	Which sector does your research fall under? (a) Public sector and research facilities (b) Academic institutions (c) Private sector (d) If other, please specify	
4	Which category does your research fall under? (a) Daylighting design	

Figure 1: Questionnaire extract

Data collection (Secondary)

- Published texts collected from web search engines and electronic academic libraries
- Selection was refined using key search terms (energy efficiency, lighting, South Africa, etc.) relating to the goal of the research.
- Texts published before 2015 were excluded to ensure that data was relevant and the research current.

Data analysis

- Thematic analysis was conducted on the selected literature and questionnaire responses. This included:

➢ Dividing the data into its respective categories of lighting

➢ Examining the data for the identification of patterns and repeated ideas that emerged.

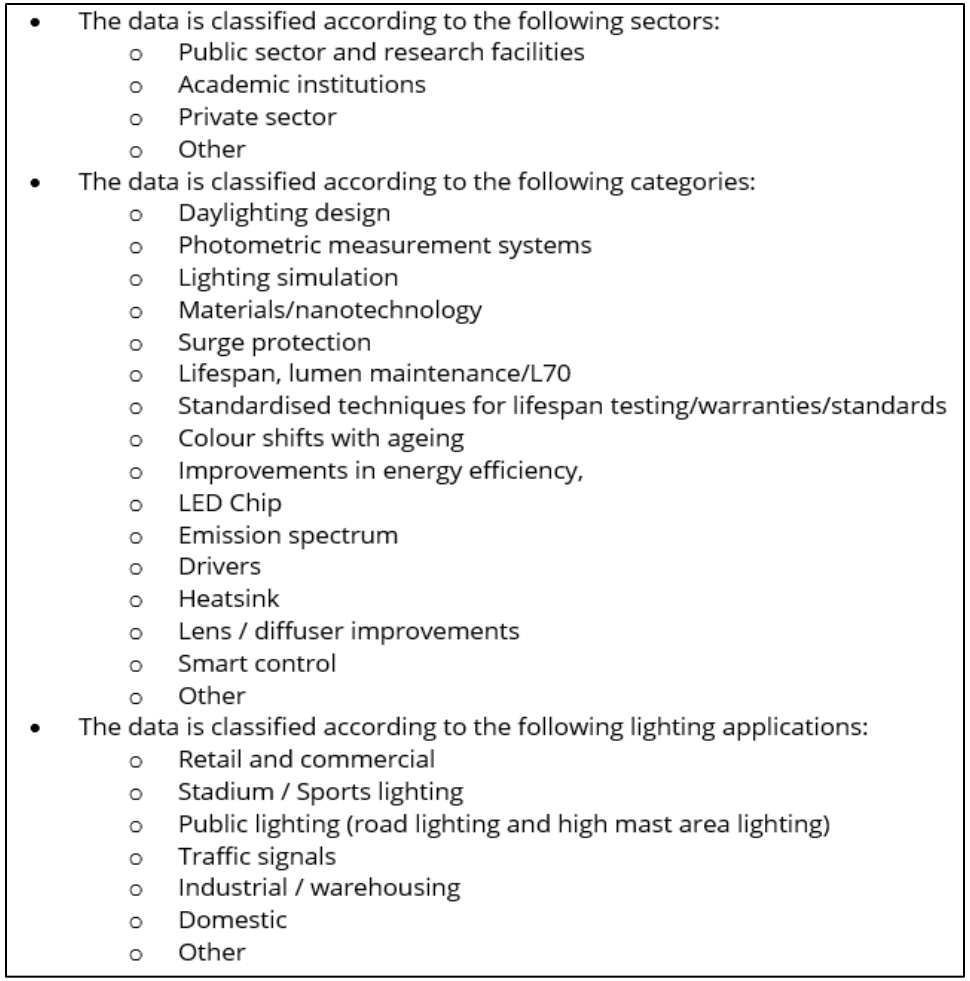
➢ Identification of gaps where no research is being undertaken.

Data analysis (cont.)

- After emerging themes were established, the data was compiled in a spreadsheet in MS Excel.
- Columns in this spreadsheet included the research themes, the category of lighting, the main researcher, and the organisation/group the organisation falls into (e.g., Universities, suppliers, etc.).
- This data was then further analysed per sector, research category and lighting application

Data analysis (cont.)

- This data was then further broken down per sector, research category and lighting application.
- The data is analysed accordingly by identifying trends and gaps in research for Energy Efficient lighting in South Africa.



- The data is classified according to the following sectors:
  - Public sector and research facilities
  - Academic institutions
  - Private sector
  - Other
- The data is classified according to the following categories:
  - Daylighting design
  - Photometric measurement systems
  - Lighting simulation
  - Materials/nanotechnology
  - Surge protection
  - Lifespan, lumen maintenance/L70
  - Standardised techniques for lifespan testing/warranties/standards
  - Colour shifts with ageing
  - Improvements in energy efficiency,
  - LED Chip
  - Emission spectrum
  - Drivers
  - Heatsink
  - Lens / diffuser improvements
  - Smart control
  - Other
- The data is classified according to the following lighting applications:
  - Retail and commercial
  - Stadium / Sports lighting
  - Public lighting (road lighting and high mast area lighting)
  - Traffic signals
  - Industrial / warehousing
  - Domestic
  - Other

Figure 2: Snippet from the final report showing the classification of data

Questionnaires received

- A total of 65 questionnaires were issued to potential researchers.

- A total of 24 questionnaires were received:
  - Public sector and research facilities = 5
  - Academic institutions = 13
  - Private sector = 6

- A total of 31 relevant articles were analysed.

Comparison of Results per Sector

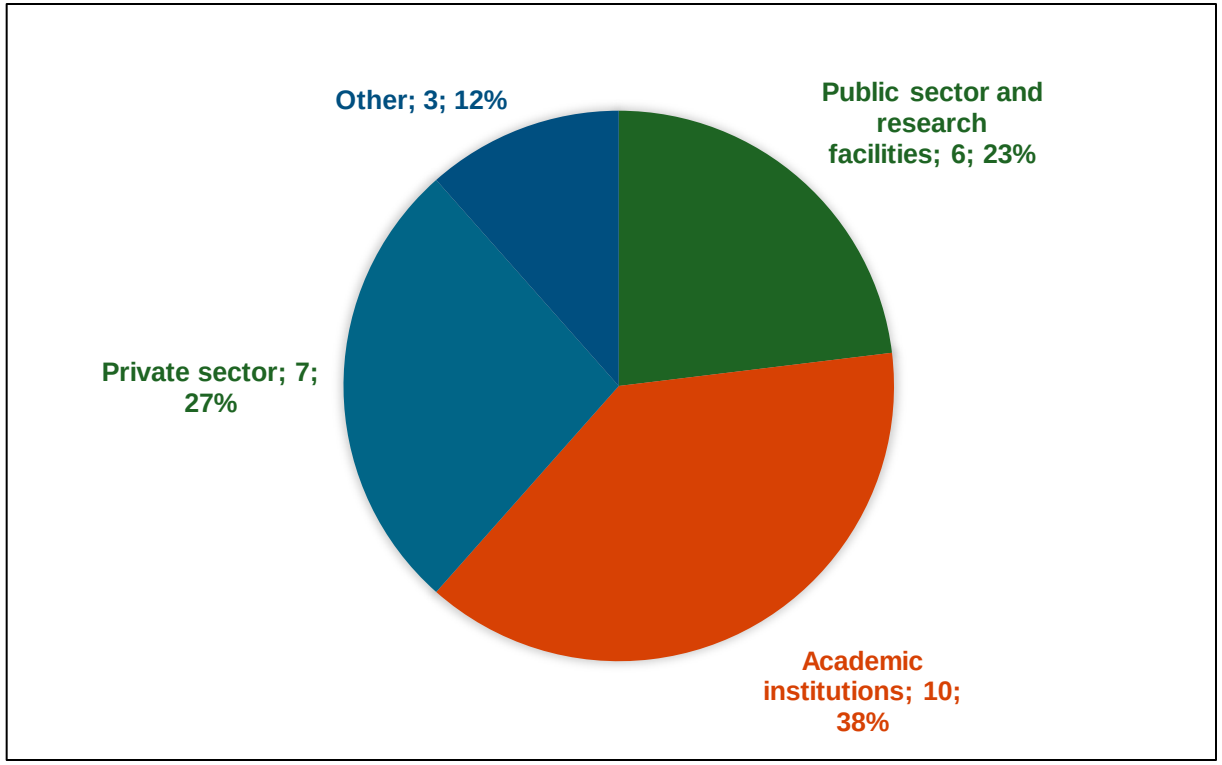


Figure 3: Questionnaire responses based on Sector of research (total 24)

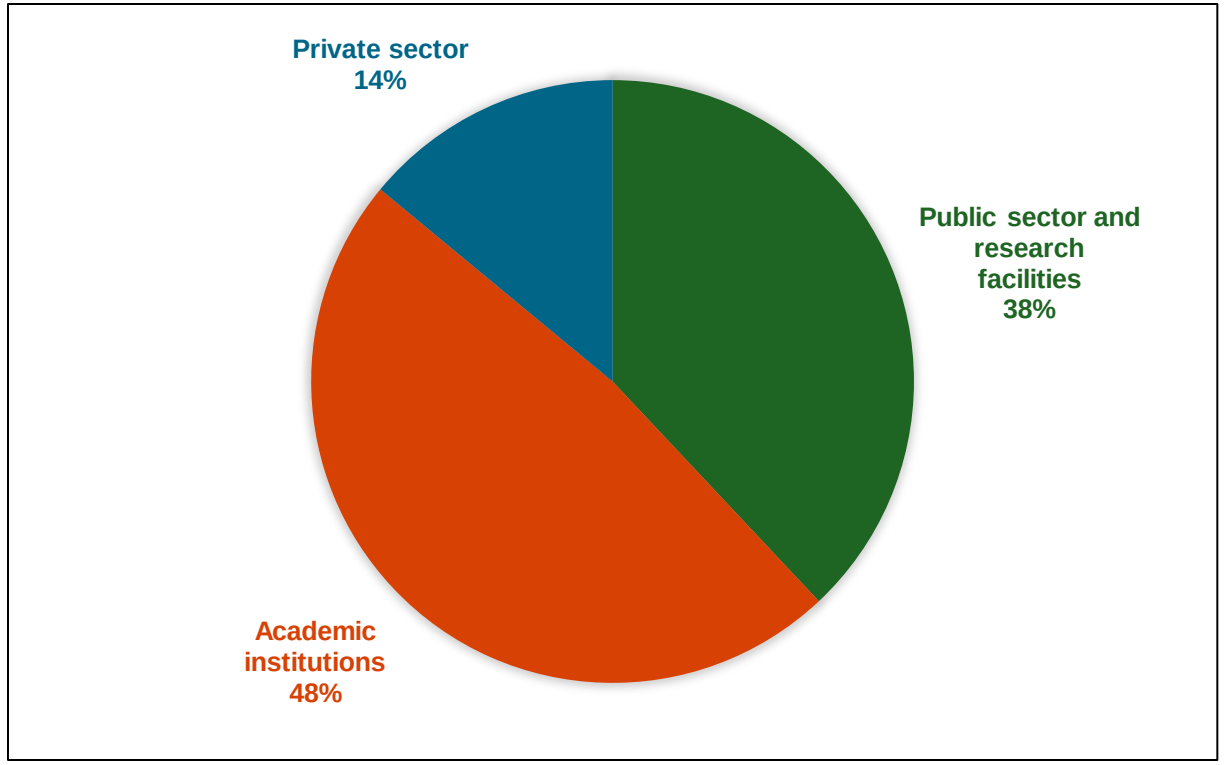


Figure 4: Articles based on Sector of research (total 31)

Comparison of Results per Research Category

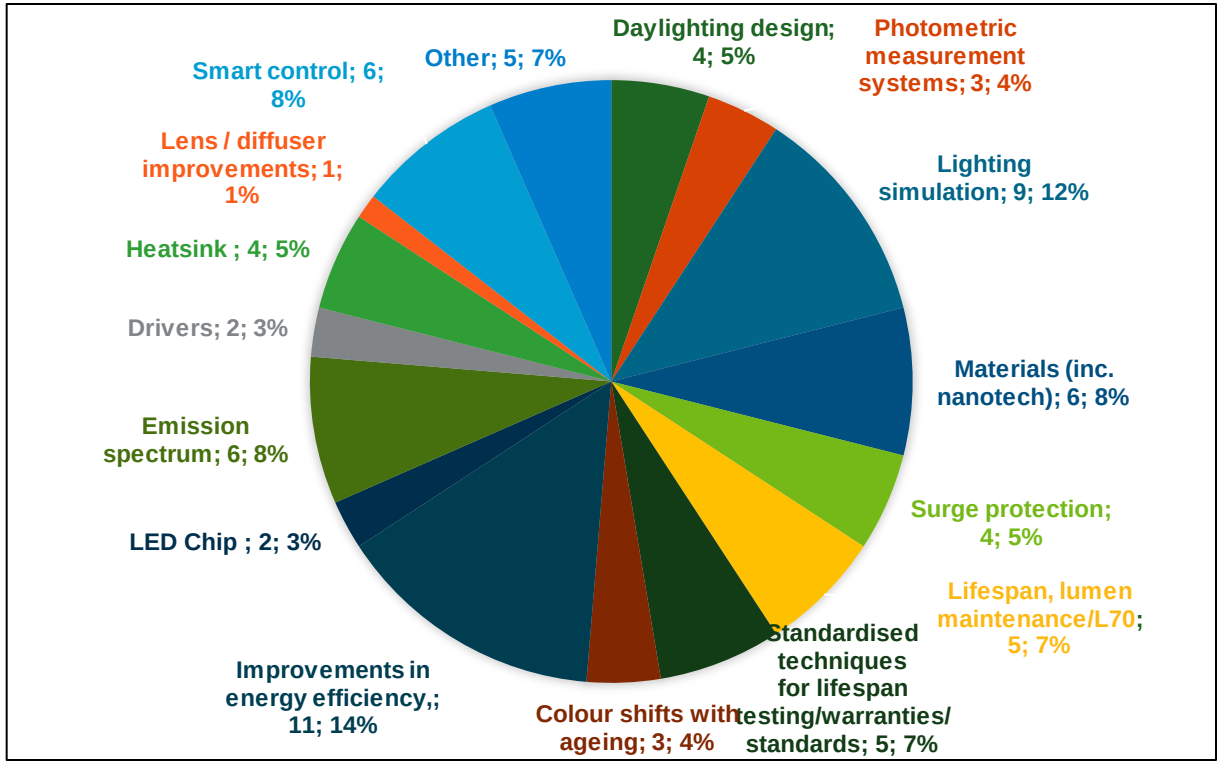


Figure 5: Questionnaire responses based on category of research (total 24)

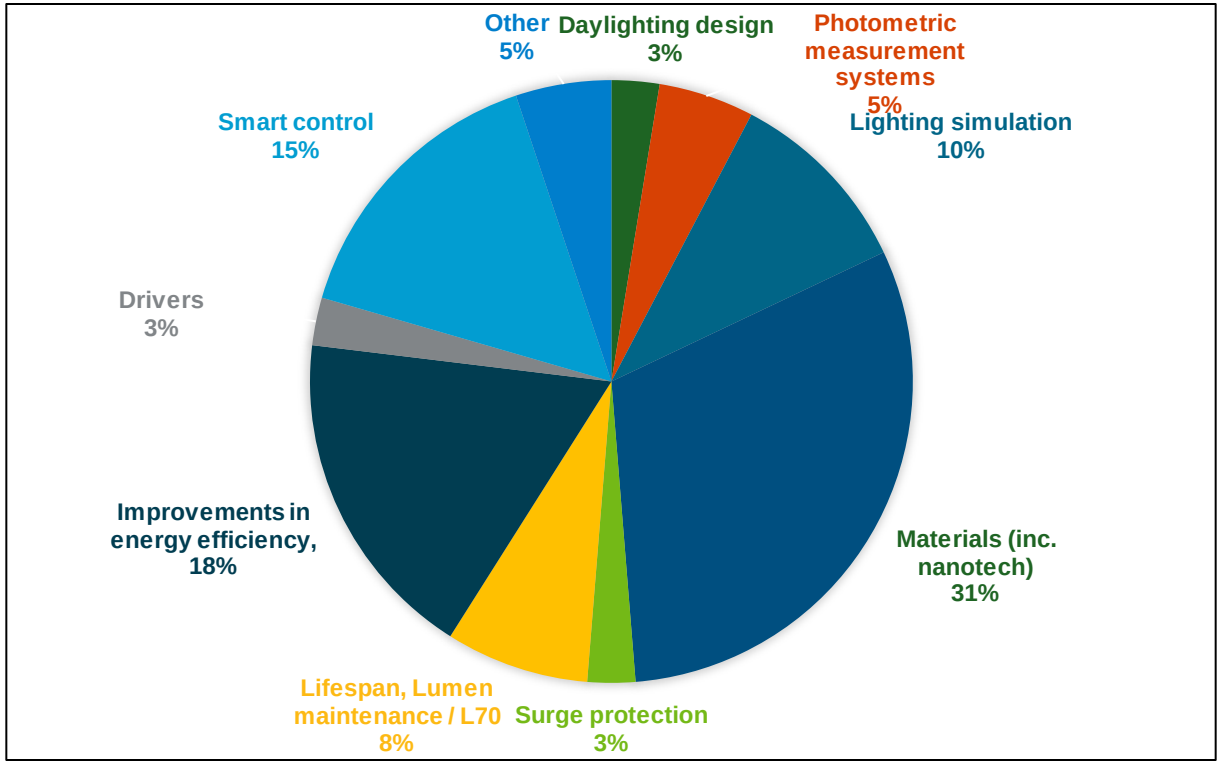


Figure 6: Articles based on category of research (total 31)

Comparison of Results per Lighting Application

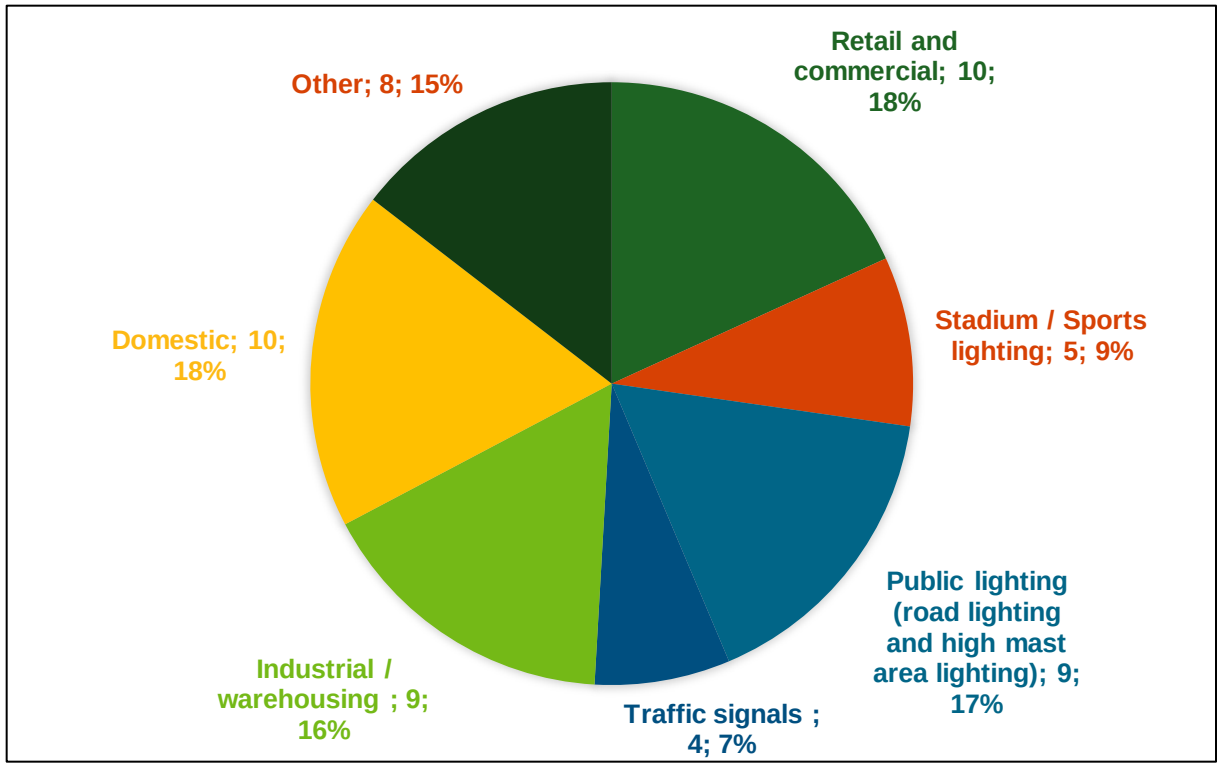


Figure 7: Questionnaire responses based on Lighting Application (total 24)

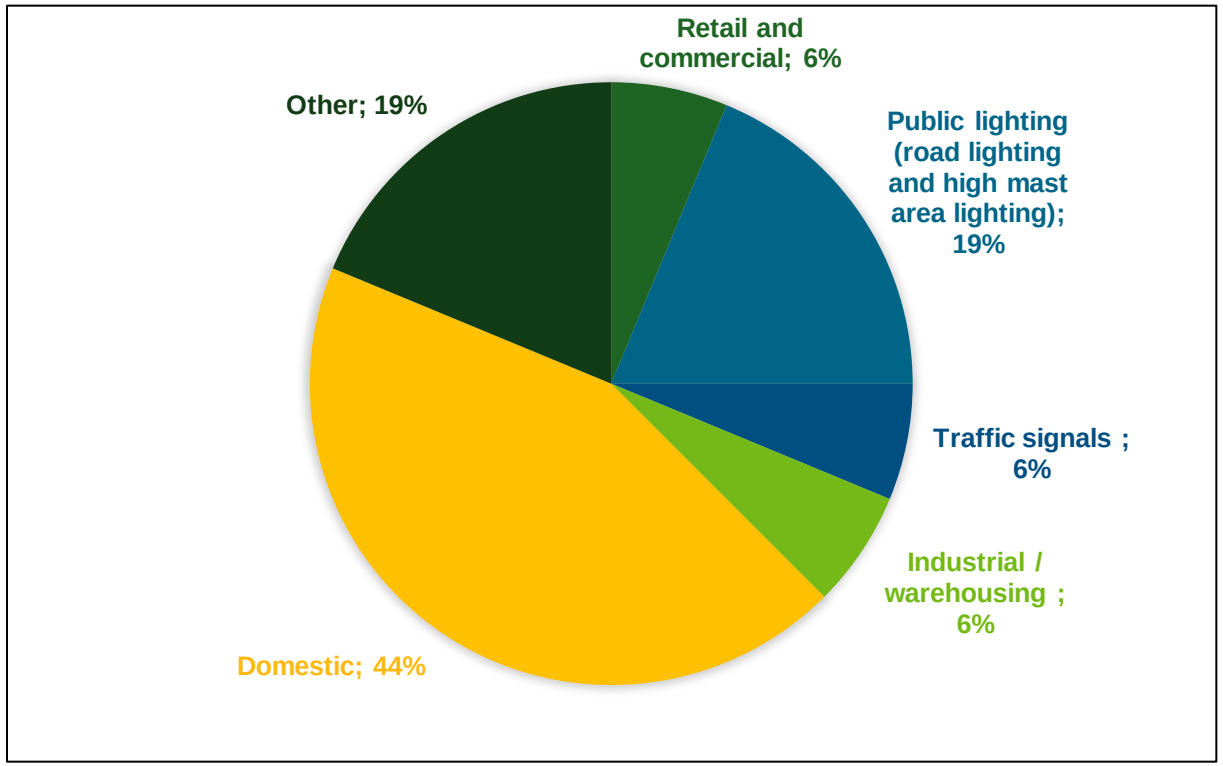


Figure 8: Articles based on Sector of Lighting Application (total 31)

Potential gaps in research

- *Implementation* of conducted research into practical applications, roll outs of programmes, etc. rather than just conducting research on the specific topics.
- *Efficiency benchmarks* - Standard methodology to compute the savings and mathematical models to predict the techno-economic potentials of the EE lighting technologies.
- *Awareness Creation* - Appropriate Motivation of the efficient lighting technologies is a key factor for driving and sustaining of initiatives in this field.
- *Electronic Drivers* - The efficiency and characteristics of the power electronics drivers for lamps is a topic which should be thoroughly investigated.
- *Electrical network interference* – Power electronics of Energy Efficient lighting can cause Electromagnetic Interference (EMI).
- *Perception of no gaps* (15%)

Conclusion

- A comprehensive study has been undertaken to catalogue the current status of Energy Efficient Lighting research in South Africa
- The most research (by a small margin) relates to domestic lighting (18% of research topics, 44% of articles).
- 24 profiles of researchers in EE lighting researchers actively working in the field have been created, which will assist future EE lighting research coordination in South Africa.