

# Initial analysis of the direct environmental impacts of CSP and PV in South Africa

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Justine Rudman

*MSc Conservation Ecology*

STERG Symposium

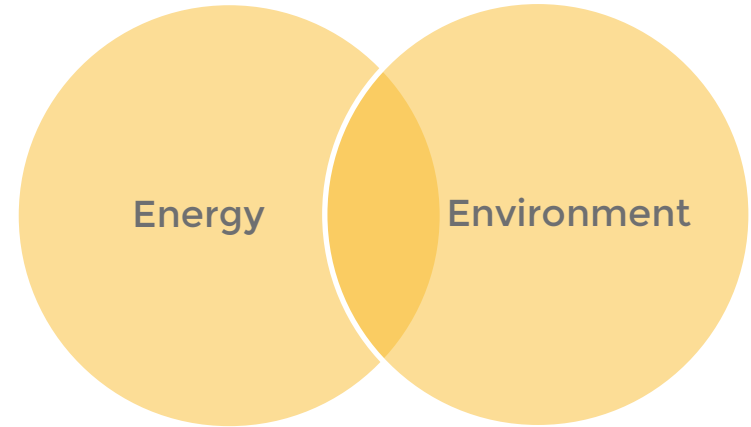
14 July 2016



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- Methodology
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- Conclusions



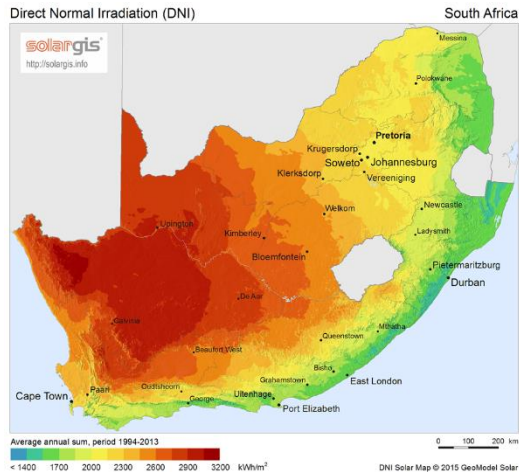
# Introduction

## The short version



**Need for  
diversification  
of energy  
system**

**Where does this  
go and what is the  
environmental  
impact?**



Technology	Total (MW)	Allocation remaining (MW)
Wind	2660	660
PV	1899	626
CSP	600	0
Small Hydro	19	116
Biomass	16	19
Biogas	0	60
Landfill	18	7
Total	5237	1488

- RE Whitepaper 2003
- IRP 2010 & Update 2013
- REIPPPP since 2011



# Introduction



## Current impact assessment approaches

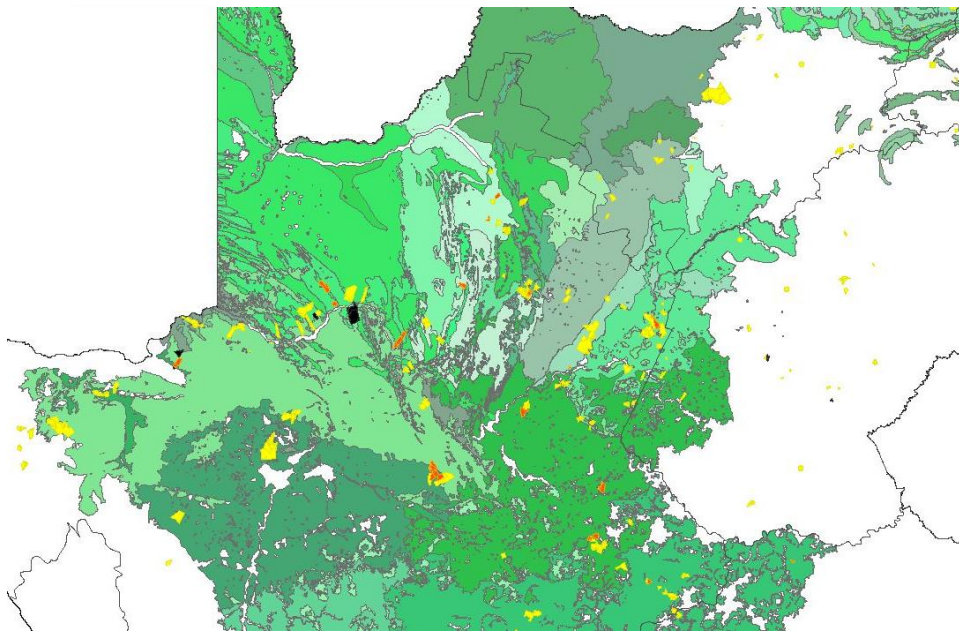
- Legislation (EIA regulations in National Environmental Management Act (Act no. 107 of 1998)
  - Mandatory EIAs at project level
- SEA for RE deployment (RE Development Zones)
  - Wind and PV only, no CSP
- Not much action in the research space



# Introduction



## Distribution of development footprints



### Biome?

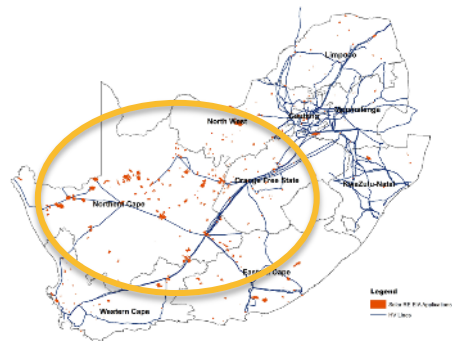
“A broad ecological unit having similar vegetation structure exposed to similar macroclimatic patterns, often linked to characteristic levels of disturbance such as grazing and fire”

(Mucina & Rutherford 2006; Low & Rebelo 1998)

# Objectives

(of whole study)

- To identify the **direct impacts** of solar power on the **natural environment** in the Nama-Karoo and Savanna biomes on a **development footprint scale**
- To provide an outlook on what this impact is on a **regional scale** and **into the future**
- To provide a starting point in **understanding** how these impacts can be **managed/mitigated locally and across the landscape**

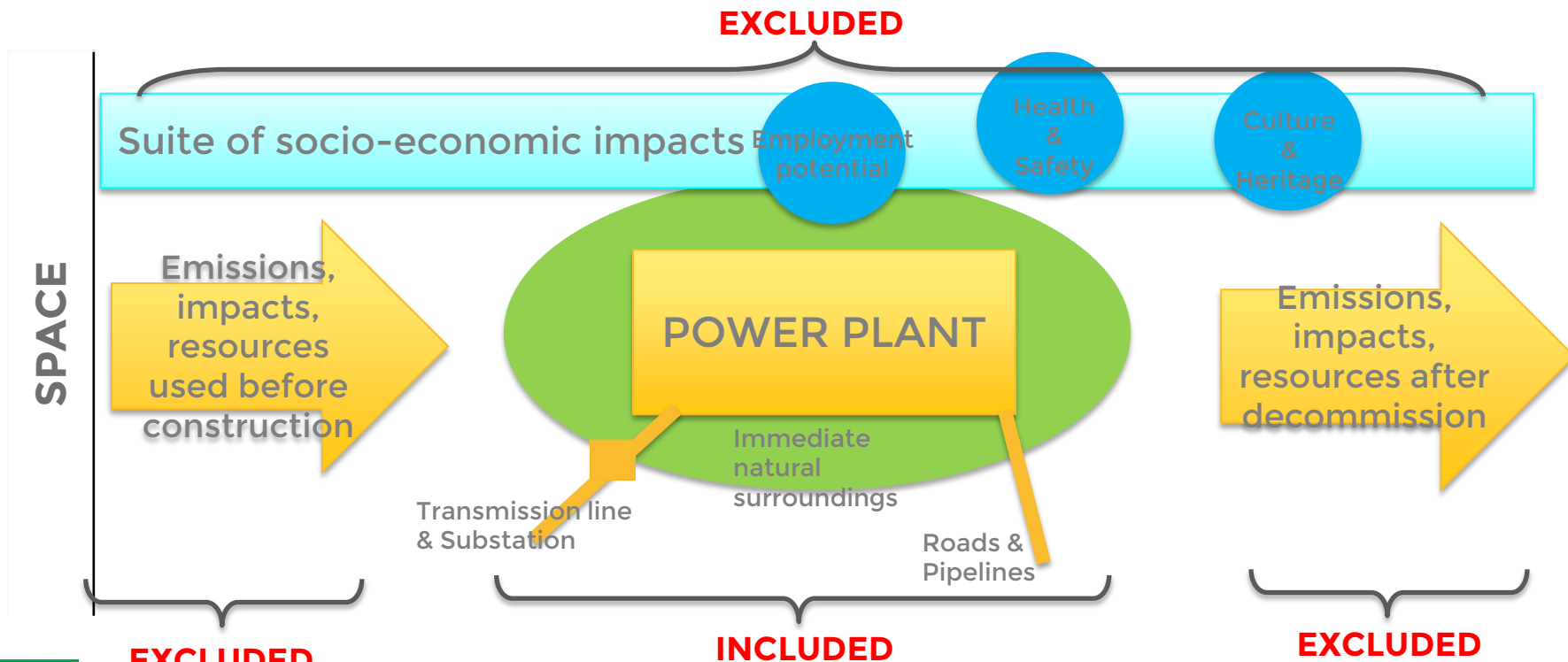


2015      2030



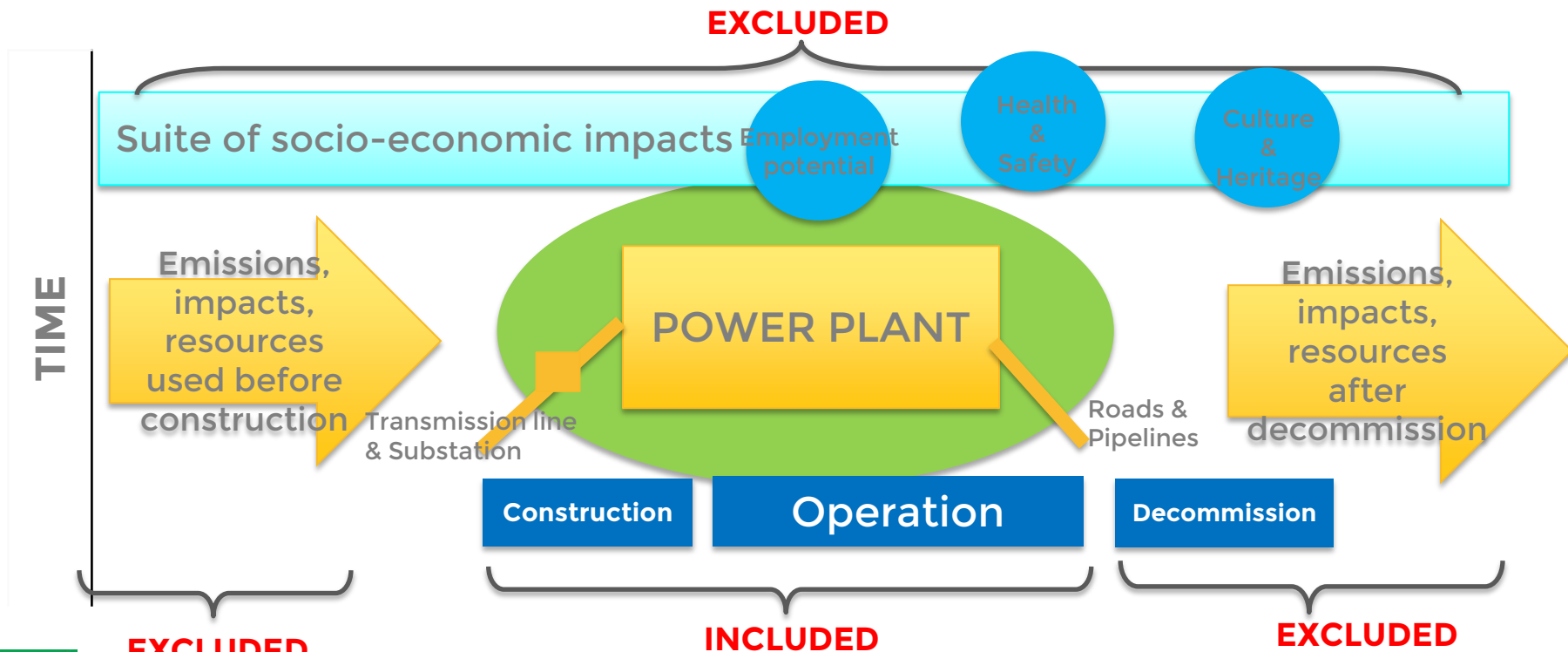


# Scope





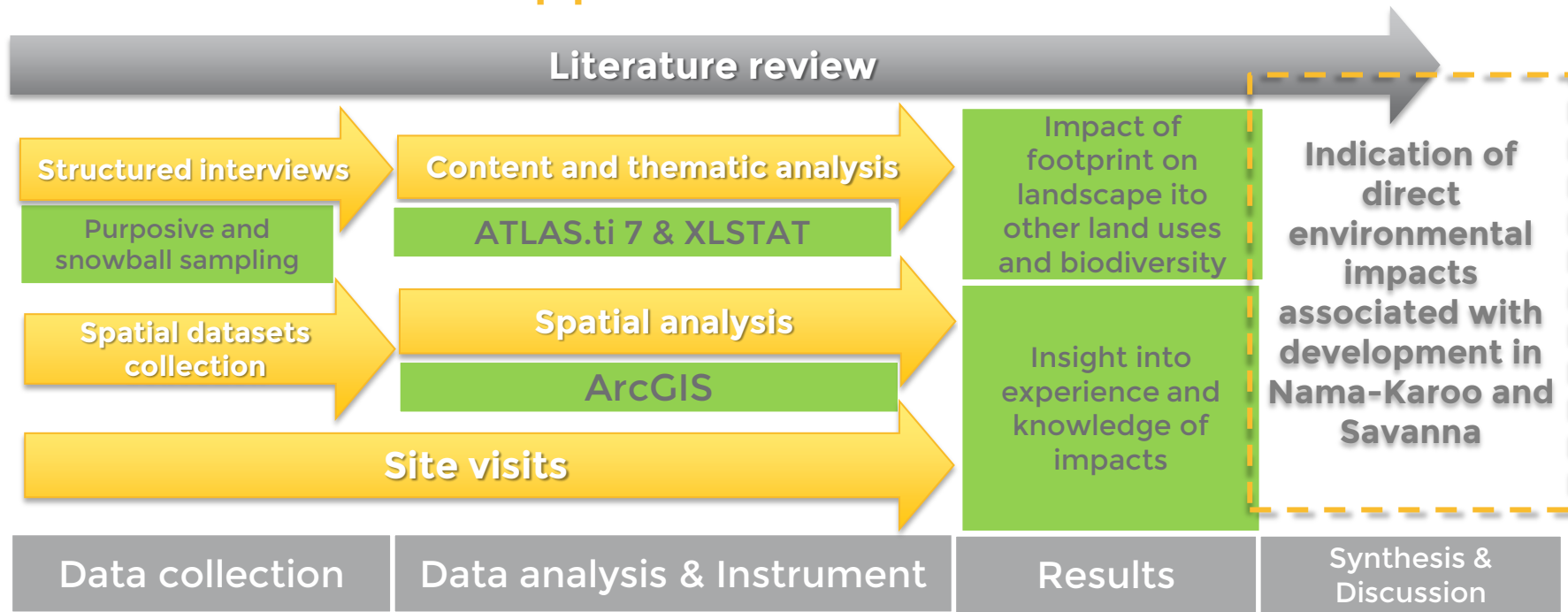
# Scope



# Methodology



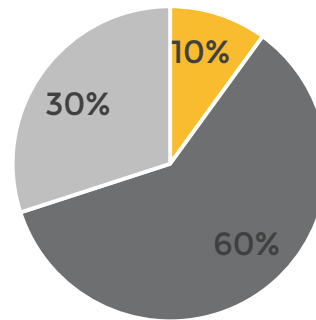
## Mixed method approach



# Methodology

## Interviewees: Sample description

Expert group	CSP	PV
Research entity	2	1
State utility	1	1
Designated authority	1	1
Registered environmental assessment practitioners	2	5
Representatives from Independent Power Producers	1	1
Legislation/policy developers	1	1
Specialists	4	3



- Honours level
- Masters
- PhD or higher



# Methodology



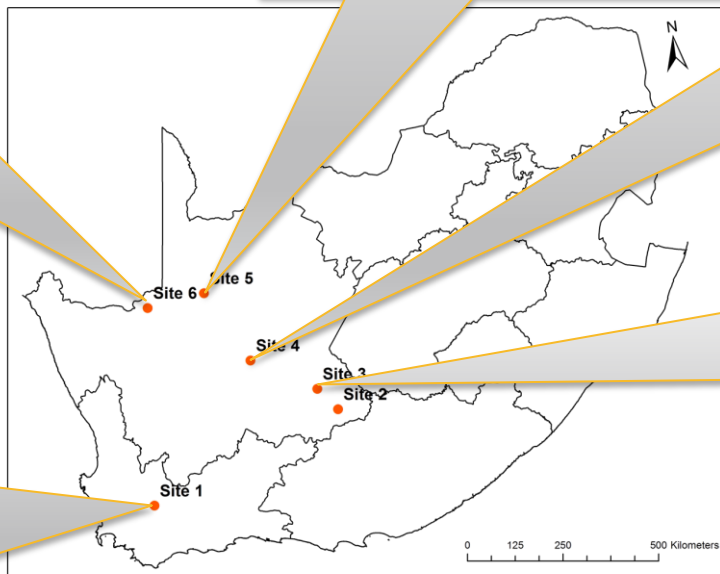
## Spatial analysis: Datasets used

Title of data set and year published	Source
South African Renewable Energy EIA Application Database Q1 2016	Department of Environmental Affairs
National Vegetation Map (Vegmap) 2012	South African National Biodiversity Institute
South African Protected Areas Data Base Q1 2016	Department of Environmental Affairs
Important Bird Areas 2015	BirdLife South Africa
National Protected Areas Expansion Strategy: Focus areas for protected area expansion 2010	SANParks
Strategic Water Source Areas 2013	Council of Scientific and Industrial Research



# Methodology

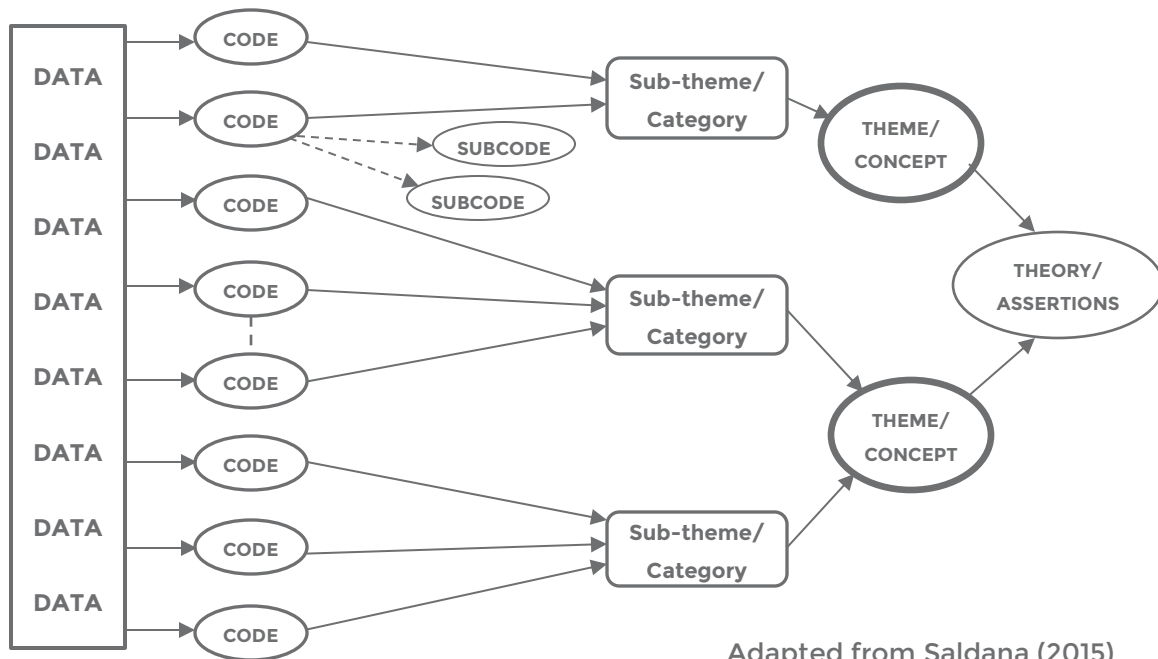
## Site visits – not today



# Results



## Structured interviews: 4 themes



Adapted from Saldana (2015)

**1. Direct biophysical impacts of solar power**

**2. Feedback on EIA process**

**3. Reference to SEA process**

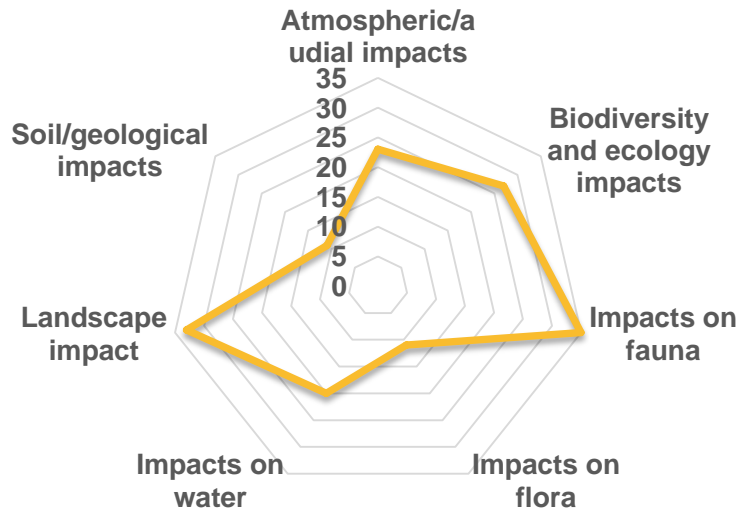
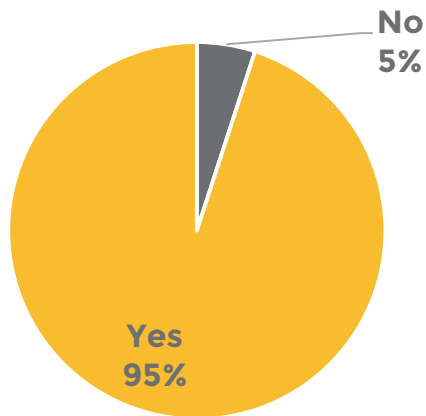
**4. Management and mitigation measures**

# Results



## Structured interviews: Theme 1

Are you aware of any adverse direct environmental impacts which solar power has?



- 47 different codes

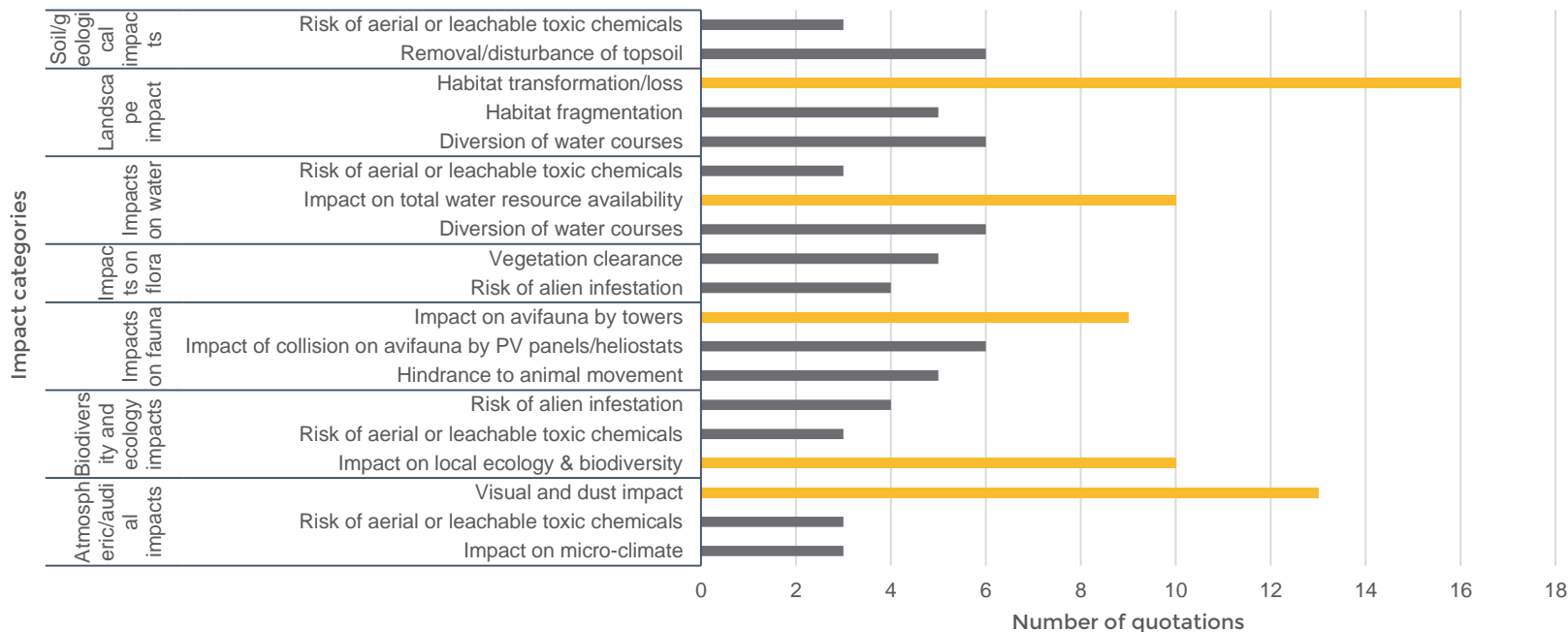




# Results



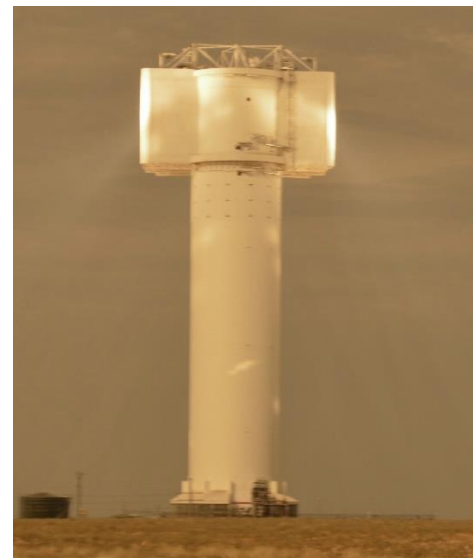
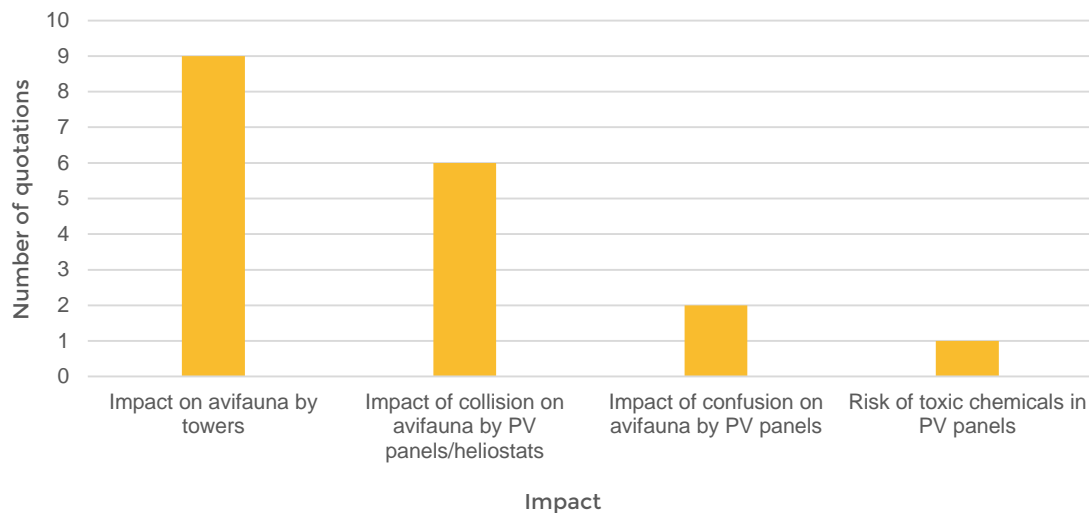
## Structured interviews: Theme 1



# Results

## Structured interviews: Theme 1

- Impacts mentioned being specifically related to either CSP or PV

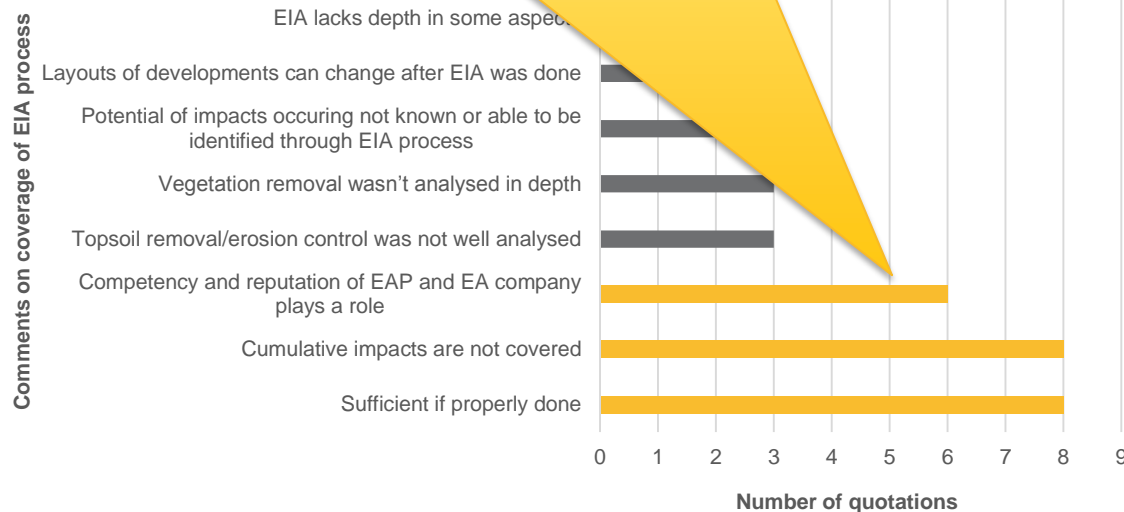
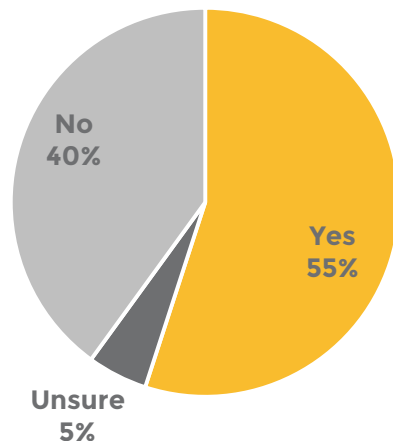


# Results

## Structure inte

- Do think the EAPs have a good understanding of impacts of solar

An EAP from the CSIR commented:  
*“EAP’s have a good understanding of impacts, but the assessment thereof is not reinforced by site visits”*

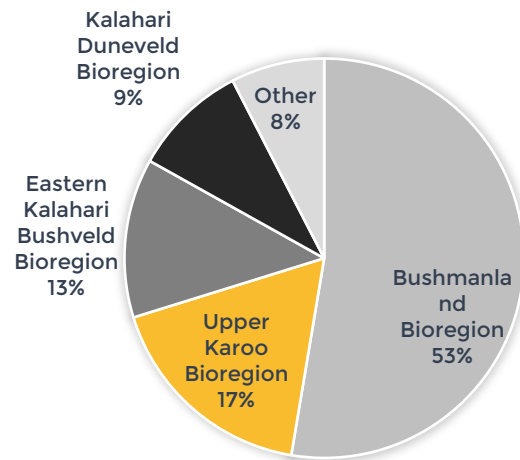


# Results



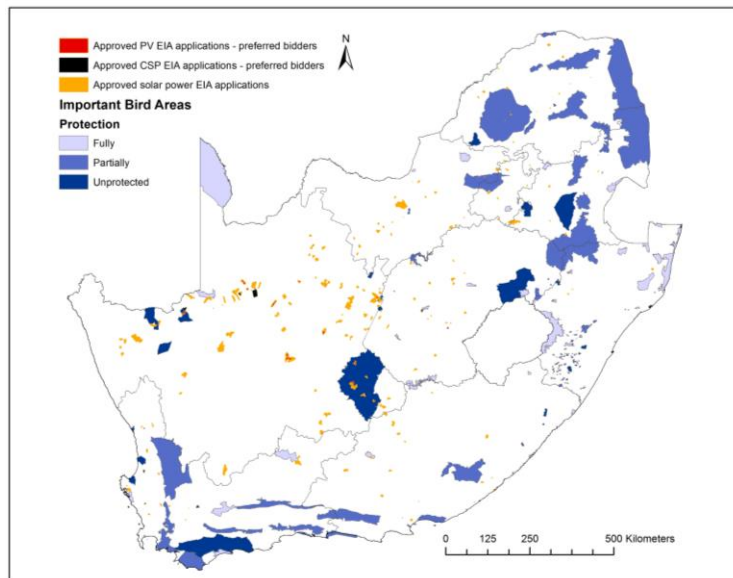
## Spatial analysis: footprint per biome

Biome	Total area approved solar EIA applications (km <sup>2</sup> )	Total area of preferred bidders' developments (km <sup>2</sup> )
<b>Nama-Karoo Biome</b>	4454.9884	702.0326
<b>Savanna Biome</b>	2854.071	228.1518
<b>Grassland Biome</b>	988.9336	16.7014
<b>Fynbos Biome</b>	256.9637	30.3973
<b>Succulent Karoo Biome</b>	234.3627	5.1049
<b>Azonal Vegetation</b>	176.4307	10.6397
<b>Albany Thicket Biome</b>	68.3532	-
<b>Desert Biome</b>	5.3781	5.3781
<b>Indian Ocean Coastal Belt</b>	0.9173	-



# Results

## Spatial analysis: IBA



Protection status	Total area of all approved EIA applications within IBA (km <sup>2</sup> )			Total area of preferred bidders' developments within IBA (km <sup>2</sup> )		
	CSP	PV	Total	CSP	PV	Total
Unprotected	18	535	553	8	169	176
Partially		12	12		0.2	0.2
Fully		20	20			

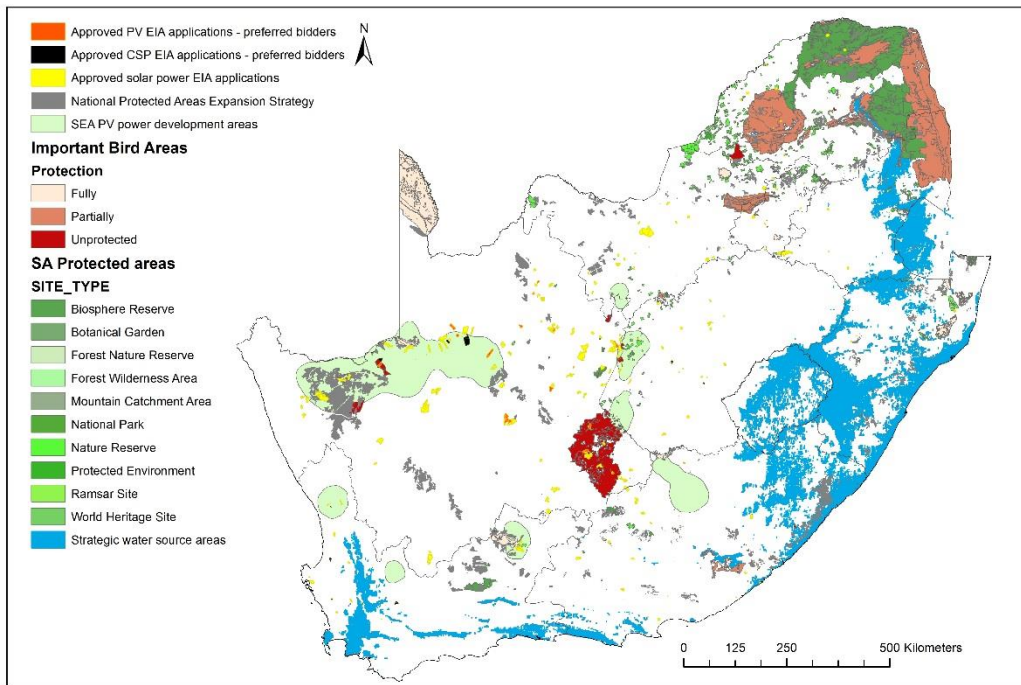
  

Proximity to IBA	All approved solar EIAs	Preferred bidders
0-1 km	10 (4%)	1 (4%)
1-5 km	8 (3.2%)	1 (4%)
5-10 km	7 (2.8%)	1 (4%)
>10 km	224 (89.9%)	24 (88%)

# Results

## Spatial analysis

- 8.5% approved solar power EIAs in protected areas
- 17.5% within 0-10km
- 3 PV PBs in biosphere reserves, no CSP PBs
- 17% of approved PV applications in SEA area of which 8% = PB (total 15% of PB)



# Conclusions



## Key findings & Recommendations

- Solar power developments does have an environmental impact – the **severity should and can be managed** and **proper siting** is pivotal
- **Cumulative environmental impacts** currently not understood or sufficiently assessed
- Knowledge base regarding the impact of solar power development slowly building in South Africa
- **Specific research needed** to investigate the impact on avifauna



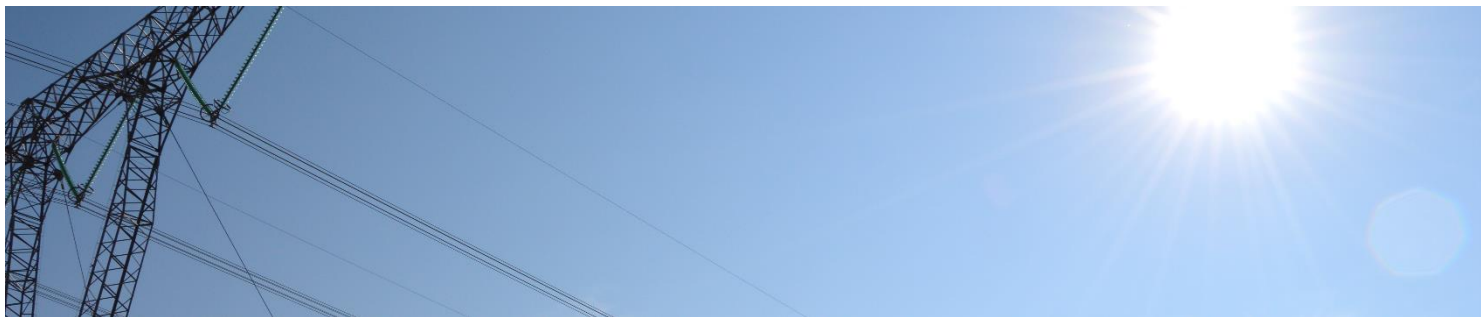


# Conclusions



## Shortcomings and limitations

- Assumptions made based on best known national plans and datasets
- Spatial analyses done based on these assumptions
- Better structured interview form and larger sample
- Usual resource limitations



# References



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- South African National Biodiversity Institute. N.d. 'Savanna Biome' and 'Nama Karoo Biome' [online] Available at: Plantzafrica.com. Accessed: 16 May 2015.
- Google Earth images



# Thank you

The background of the slide features a grayscale photograph of a solar field. In the foreground, several large, dark, rectangular solar concentrators are mounted on tracking systems, angled towards the sky. The sky is a light, hazy gray. The overall composition is a low-angle shot, emphasizing the scale of the solar equipment.

## ACKNOWLEDGEMENTS:

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## CONTACT DETAILS:

**Justine Rudman**  
Solar Thermal Energy Research  
Group (STERG)  
Stellenbosch University  
South Africa

[justine@sun.ac.za](mailto:justine@sun.ac.za)  
+27 (0)21 808 4016

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