

**Eskom Management Systems
to avoid or mitigate the
Biodiversity impacts
of Wind energy projects**

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Eskom
South Africa

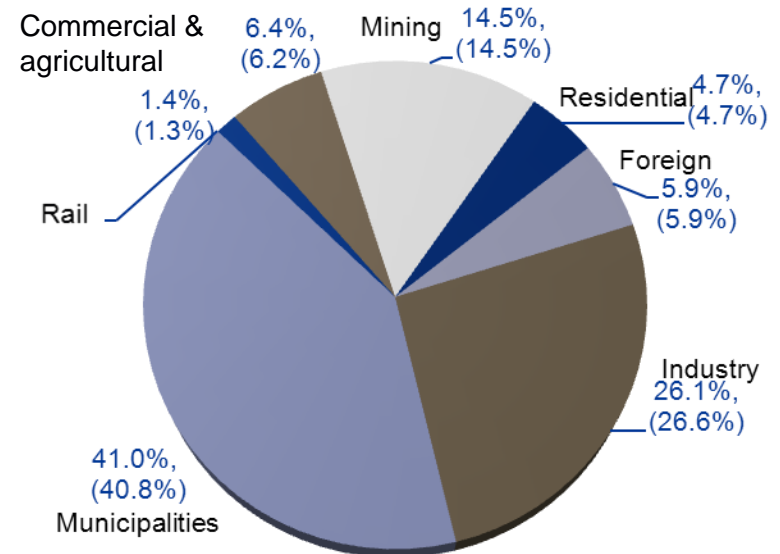
14 September 2012



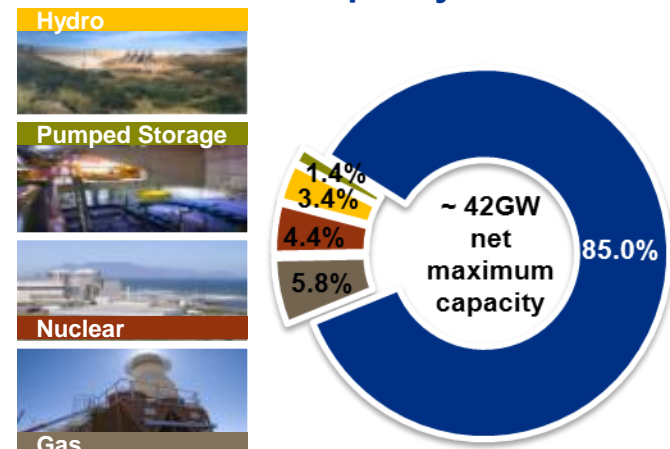
- Eskom's environmental management systems
- Eskom Policies and governance structures to mitigate biodiversity impacts
- How wildlife interactions became an integral part of Eskom's business
 - Overview of the Eskom/ Endangered Wildlife Trust Strategic Partnership
- Engagements with Birdlife South Africa
- Wind energy projects
 - Tools to avoid or mitigate biodiversity impacts

- Strategic 100% state-owned electricity utility, strongly supported by the government
- Supplies approximately 95% of South Africa's electricity and more than 40% of Africa's electricity
- For the year ended 31 March 2012:
 - Electricity sales of 224 785GWh (2011: 224 446GWh) and electricity revenues of R113.0bn (2011: R90.38bn)
- As at 31 March 2012:
 - 43 473 (2011: 41 778) employees
 - 4.9 million (2011: 4.7 million) customers
 - Net maximum generating capacity of 41 647MW (2011: 41 194MW)
 - 399 750km (2011: 395 419km) of power lines and cables
 - Moody's and S&P ratings: Baa2 and BBB+ with a negative outlook (2011 outlook: stable)
- 17.1GW of new generation capacity by 31 March 2018, of which 5.8GW already commissioned

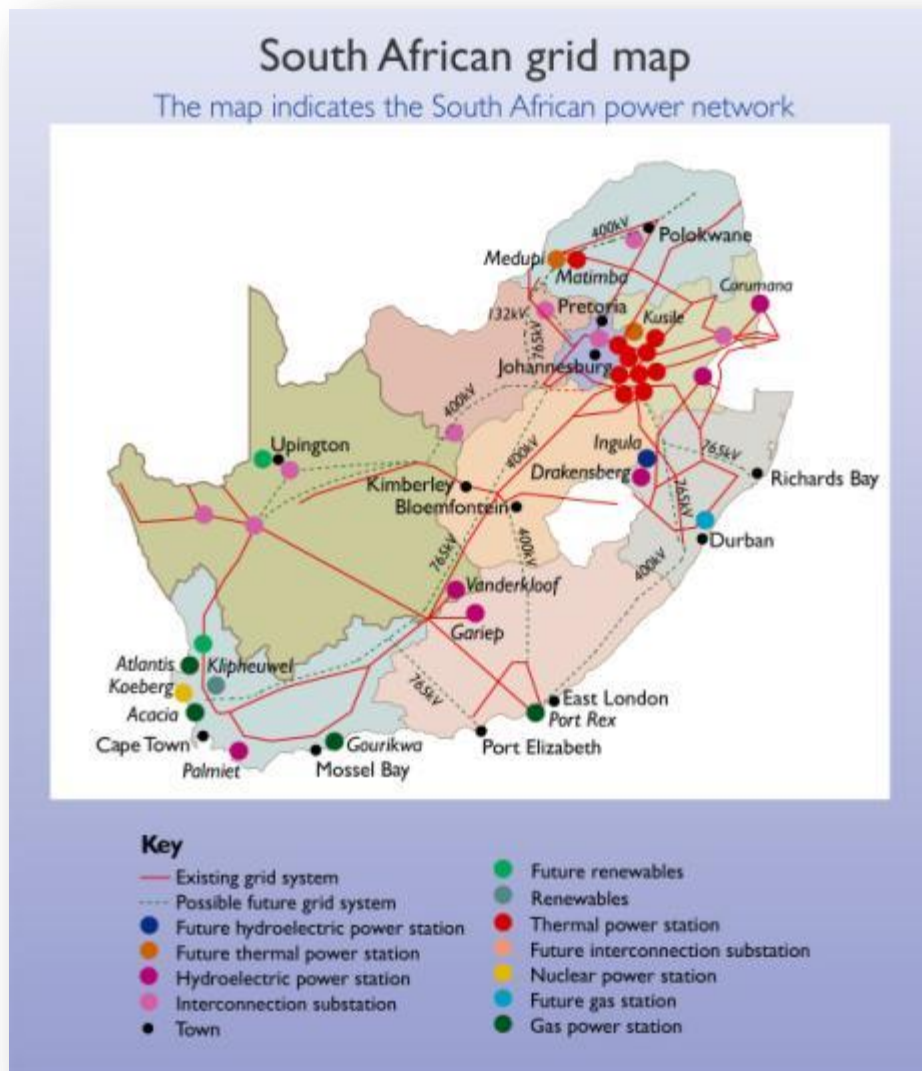
Eskom electricity sales by customer for the year ended 31 March 2012 (31 March 2011)



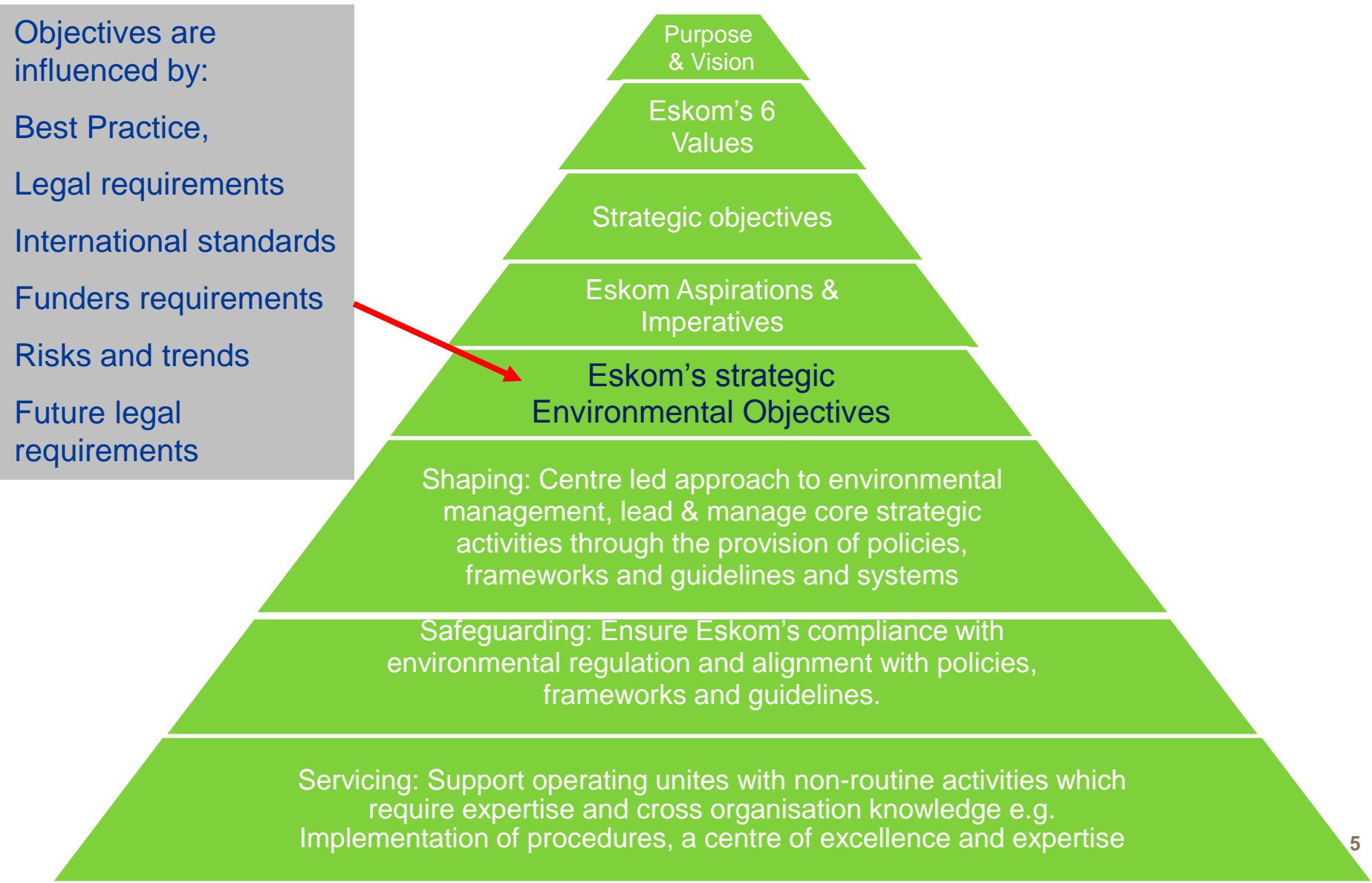
Eskom's net capacity mix – 31 March 2012



Power station map



Environmental strategic focus areas (1)



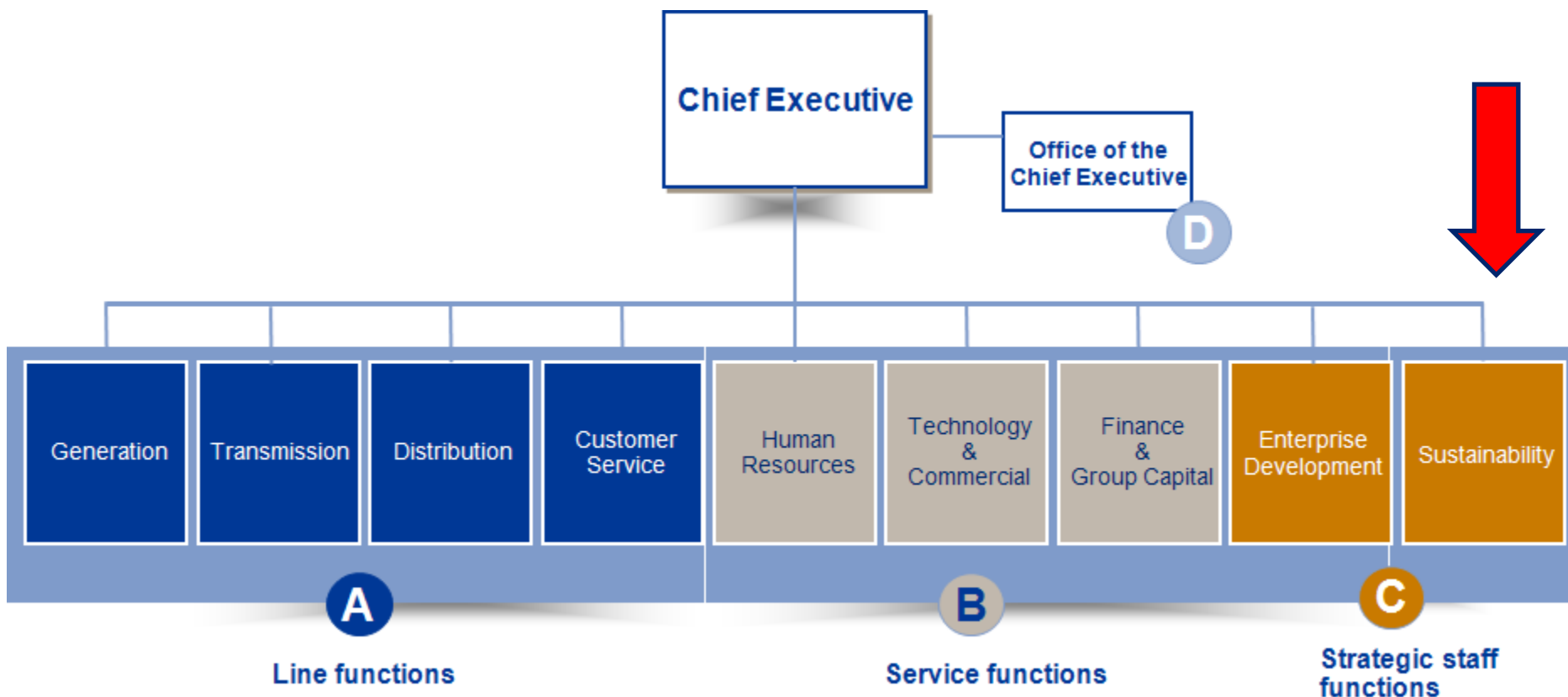
Environmental strategic focus areas (2)

For Eskom to be recognised as a world class utility through its environmental management practices and environmental duty of care the following key objectives have been set:

- 1.Avoiding harm to the natural environment** minimising financial and legal liabilities
- 2.Reducing the carbon footprint** through efficient production and change of energy mix
- 3.Reducing particulate and gaseous emissions** to minimise the impact on human health and complying with regulated emission standards
- 4.Reducing fresh water usage and eliminating liquid effluent discharge** to avoid impacting water resources through effective water management processes and the use of mine water
- 5.Enhancing efficiency of waste management** through reduction, reuse and recycling
- 6.Achieving legal compliance to environmental legislation** as a minimum requirement in all activities
- 7.Minimising the impact of our activities on ecosystems** and enhance ecosystem services through responsible land management practices

These have been set in the Eskom Environmental Management Strategy, unpacked into the Business Plan, policies and standards set and measured against key performance indicator.

Eskom Structure – February 2012 – Where Environmental Management fits in



The Sustainability Systems Mandate will be delivered through the fulfillment of key responsibilities

Role

Key Responsibilities

Mandate

A

Shaping

- Setting policy, procedures and standards
- Standardise and align SHEQ policy across Eskom
- SHE-S policy and strategy development
- Change management and communication regarding changes in legislation, policies and procedures, best practices
- Influence and Input to national and international legislative and business processes in the SHE-S environment
- Management of governance structures e.g. Eskom Security Committee and National SHE-S committees
- Influence and position company governance and practices (business plan, decision-making process,)

B

Safeguarding

- Provide Assurance and prevent liability to each Division and thus to Eskom as a whole
- Develop indicators for monitoring and integrated reporting on performance
- Monitoring of and assistance with implementation of SHE-S strategy in the operating units to catalyse culture change
- Internal and external advocacy and stakeholder management
- Provide SHE-S systems
- Corporate legal investigations and related advice in terms of legal aspects
- Peer reviews
- Comply with and Influence Legislation

C

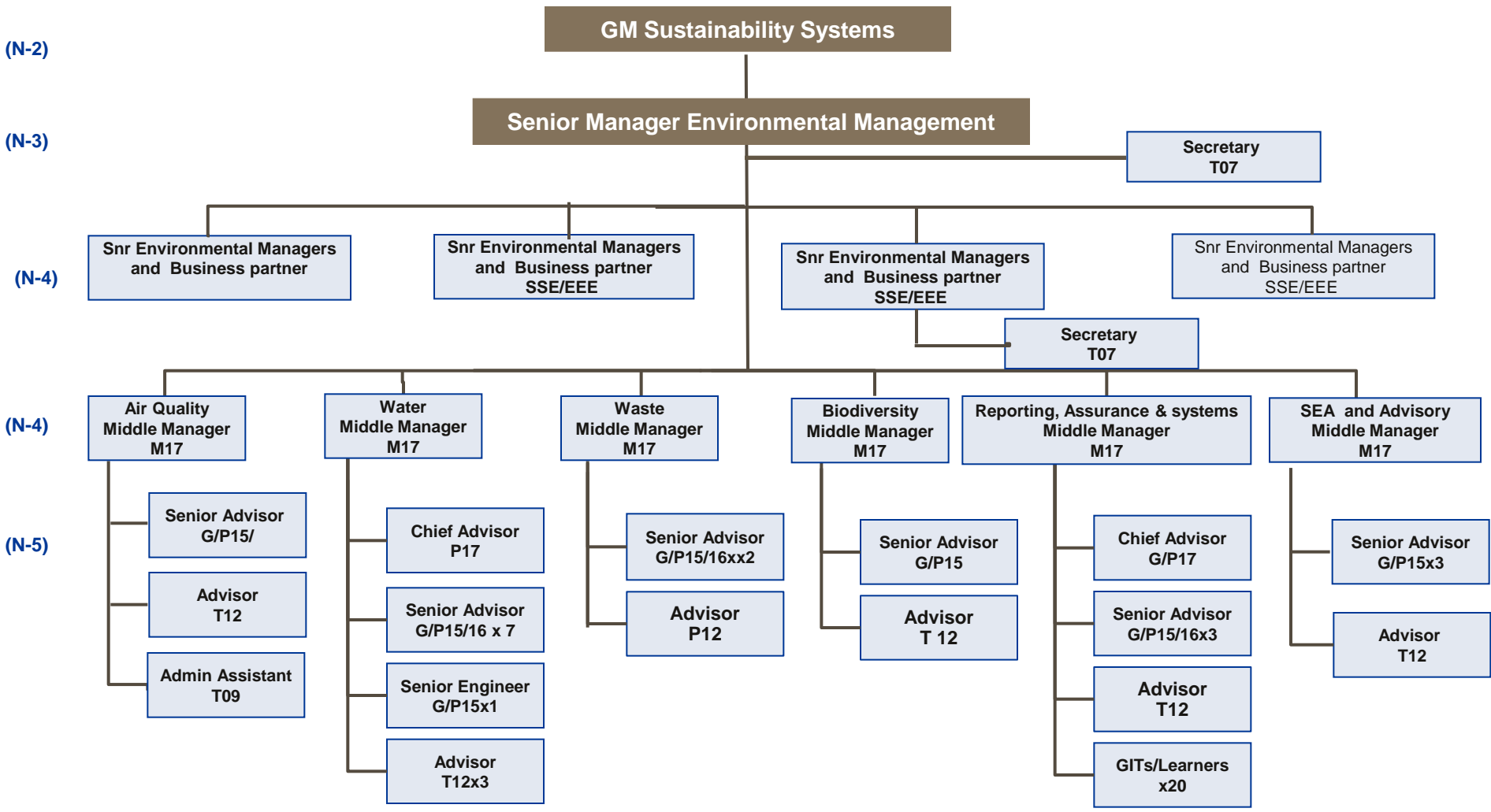
Specialised Servicing

- Integration of planning inputs to decision making
- Develop business processes for Level 1 requirements as per our mandate
- Develop mechanism and processes for integrating with SHE-S Operating Units
- Provide specialised services/advice in SHE-S
- Skills development i.e. mentorship, coaching, training, capacity building
- Corporate consulting / advisory activities (i.e. GE support through allocation of dedicated resources - , B2B, licensing processes, development of improvement plans)
- Internal and external communication

1

To direct a core group of specialist skills in the areas of SHE and security to develop , facilitate and monitor the implementation of relevant strategy and policy. To provide overall assurance to the business that risk and opportunities in these areas are being managed

Sustainability Division: Environmental Management Organisational Structure Level N-4 – N7

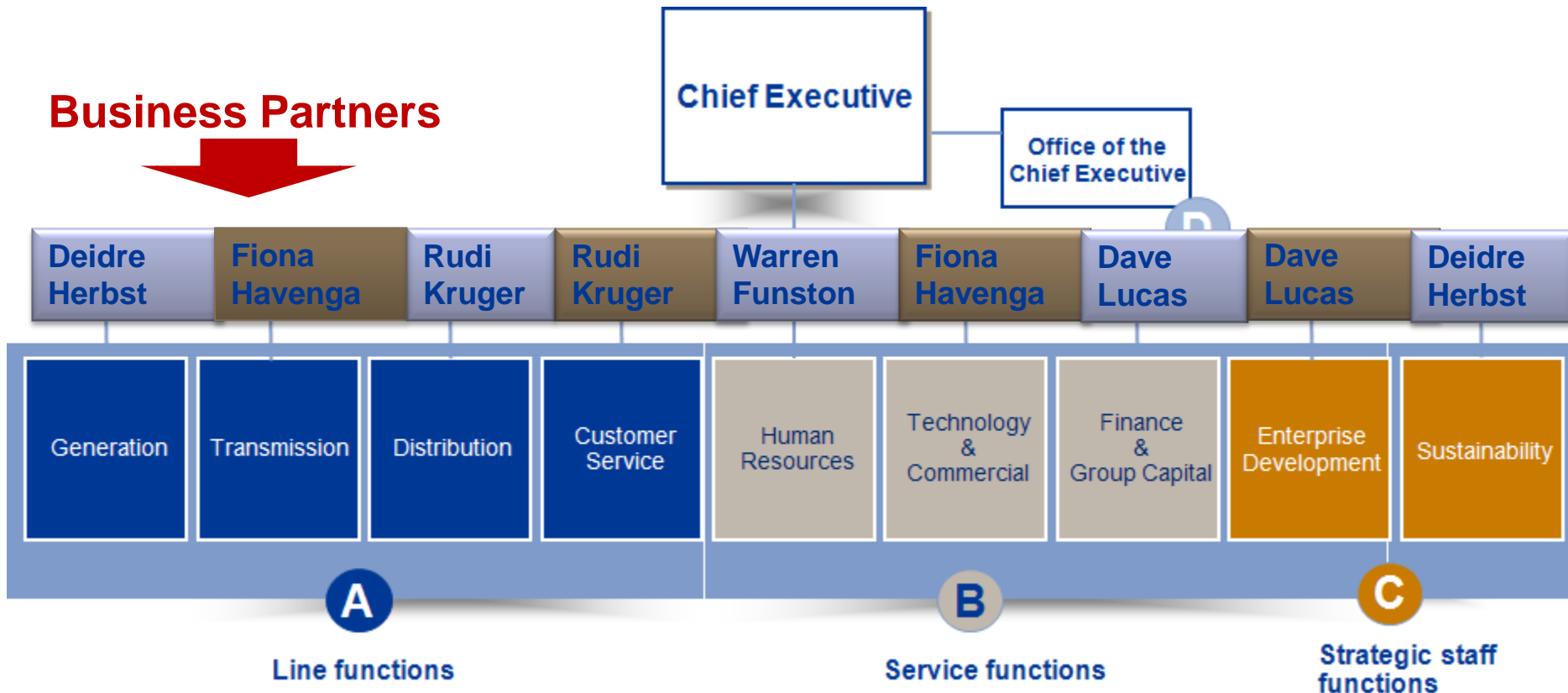


Approved by GE : _____
 Date : _____

Approved by DE EDU : _____
 Date : _____

Sustainability Division: Environmental Management business partners and “sponsors”

Business Partners



Environmental Sponsors



Roles and Responsibilities for Business Partners in Sustainability

The Business Partners in Sustainability Systems provide specialised advise to divisions and operating units in the form of:

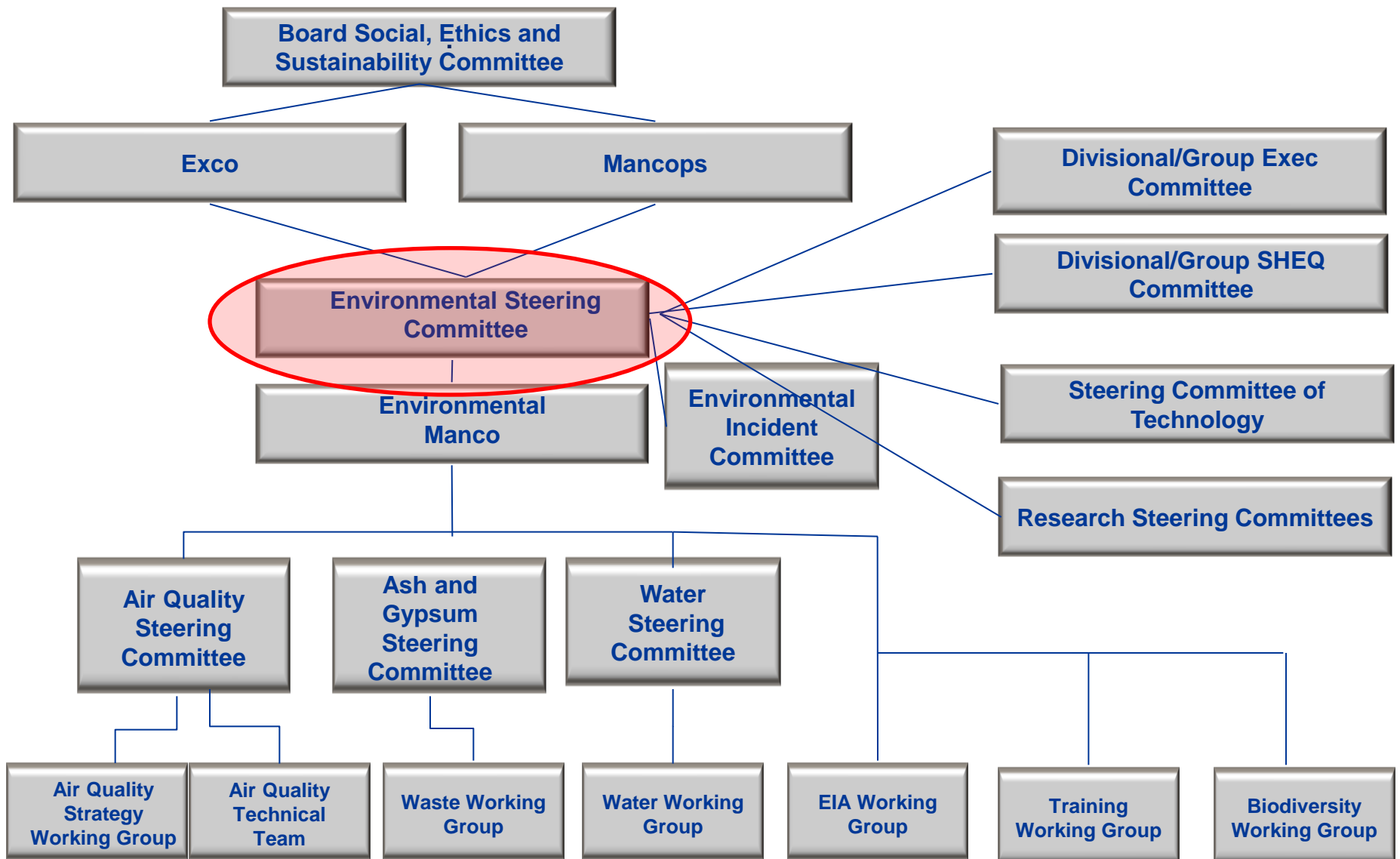
1. Supporting Divisional Senior Management in the realisation of the Safety, Health, Environment and Security (SHE-S) vision, implementation of strategies and procedures promoting continual improvement and equipping leaders to become visible and committed.
2. Providing a support framework for a risk- based approach to SHE-S management which will align with Divisional SHE-S management processes i.e. ensure that divisions have a risk profile and that actions are implemented to address risks identified.
3. Ensuring that the Divisions/OUs identifies, documents, maintains, communicates applicable legal, regulatory and other SHE-S requirements which are understood and accessible ie translating legal requirements into what it means for the business.
4. Ensuring that all incidents are reported, investigated and analysed and that appropriate corrective and preventive actions are taken and closed out and lessons shared.
5. Ensuring SHE-S performance and systems are monitored, audited and reviewed to identify trends, measure progress and assess compliance and that SHE-s objectives are targets are integrated in the business planning process.

Roles and Responsibilities for Business Partners in Sustainability

The Business Partners in Sustainability Systems provide specialised advise to divisions and operating units in the form of:

6. Be the conscious and “watchdog” for the Group/Divisional Executive in terms of compliance to SHE- S system and strategies.
7. Participating in the development of the SHE-S strategies and ensuring that the divisions unpack and include this in their SHE-S action plans i.e. alignment with corporate strategy.
8. Ensure that all information required by the respective stakeholders of the Division is accurate, complete and timeously presented.
9. Ensure all OU SHE-S staff are subjected to a robust development plan to stay in touch with emerging risks, and be competent to perform their duties . This includes a mentorship and coaching role as required.
10. Engage with external stakeholders and assist with the development of a stakeholder engagement plan.
11. Actively assist, engage and direct the Centres of Excellences (CoE’s) where this accountability has been established.
12. Draft briefings and arrange campaigns etc.. when required for the business.

Setting ourselves up for success: Environment Governance Structure 2012 (draft)



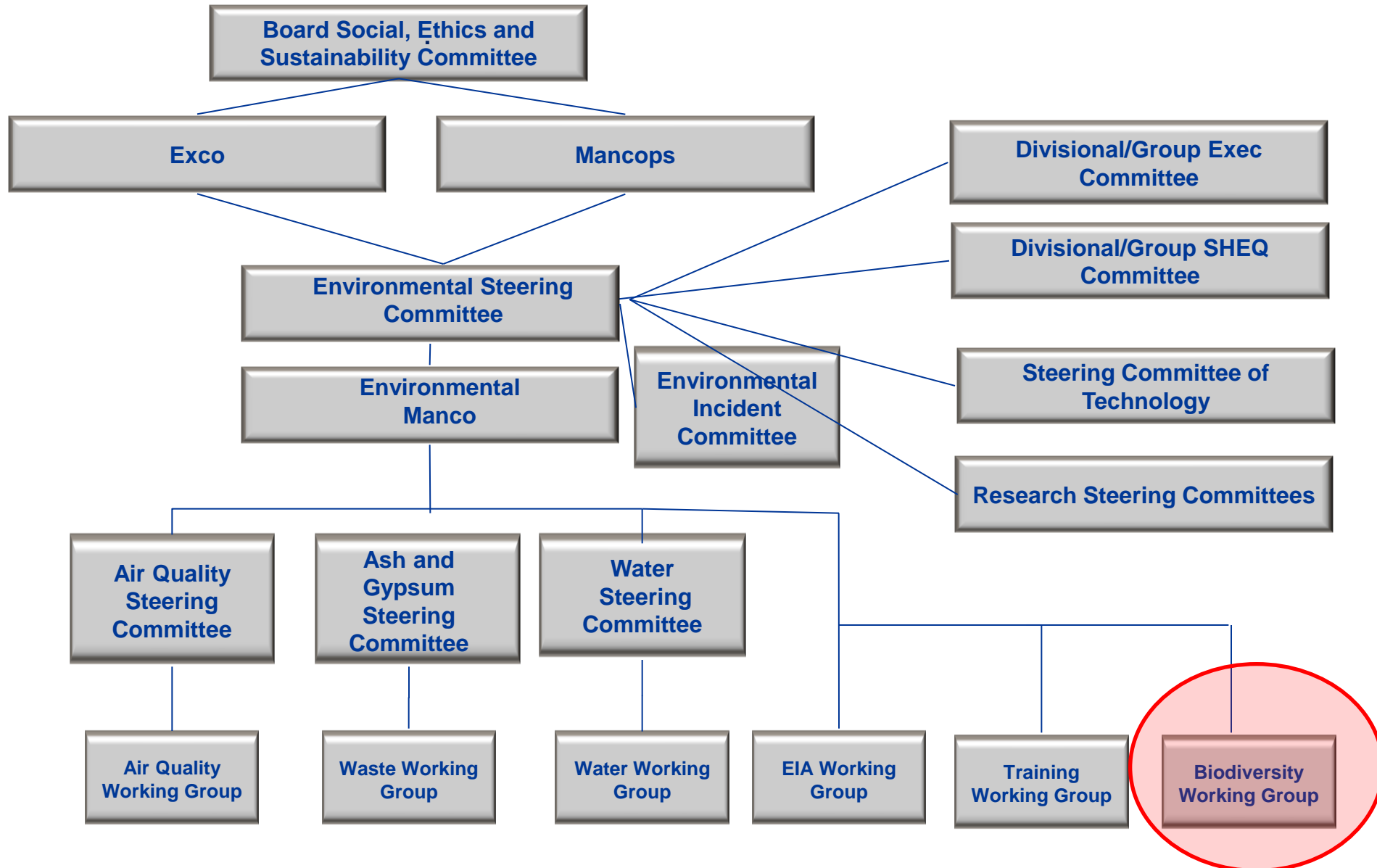
ENVIRONMENTAL STEERING COMMITTEE (ESC) MANDATE

Provide assistance to the Eskom environmental manager in co-ordinating environmental activities across the organisation.

Issues which the committee may address include:

- Strategy, programme, Centres of Excellence (CoE) and key project development
- Benchmarking, setting objectives, KPI's and reporting
- Responding to legislation
- Research
- Skills development
- Communication and Stakeholder engagement

Setting ourselves up for success: Environment Governance Structure 2012 (draft)



BIODIVERSITY WORKING GROUP MANDATE

- Reviewing all partnerships with NGO's (EWT, BLSA etc.) and identify potential new partnerships and networking forums (SANPARKS, SANBI etc.)
- Reviewing KPIs and develop a biodiversity index for Eskom
- Communication strategy for Land and Biodiversity policy and standard and developing oversight mechanisms.
- Completing risk profile for biodiversity
- Legal register for biodiversity
- Biodiversity assessments at key sites
- Commodity strategy for Vegetation Management
- Awareness

BIODIVERSITY WORKING GROUP ATTENDEES

- Chairperson: Rudi Kruger - Sustainability Division, Environmental Management
- Secretariat and coordinator: Inba Pillay, Senior Environmental Advisor, Environmental Management
 - Tel: 011 800 3436
 - Cell: 084 506 5564
 - Email: pillaylb@eskom.co.za
- Environmental Management
- Attendees:
 - Hein Vosloo – Transmission;
 - Ian Jameson – Climate Change and Sustainable Development
 - Michael D Michael - Sustainability Division, Research, Testing and Development
 - Peter Nelson - Generation, Peaking
 - Kishaylin Chetty – Sustainability Division, Environmental Management
 - Inba Pillay – Sustainability Division, Environmental Management
 - Indira Josephine – Transmission
 - Daphney Ramaphosa – Group Capital
 - Phindile Dlamini - Transmission

- Environmental aspects are integrated into business processes through **setting and implementing policy** and having **robust governance structures** to ensure **integrated decision-making and action**
- Reviewing performance so that we can act and **continually improve performance**

ISO 14001 ENVIRONMENTAL MANAGEMENT SYSTEMS



Eskom Land and Biodiversity Policy and Standard: Policy Statement

- Eskom shall ensure that in the planning, construction, operation and decommissioning of its activities measures are in place to limit the impact of its infrastructure, land-use and other resource uses on biodiversity and shall comply with all applicable legislation.
- Eskom's position on managing biodiversity impacts shall be based on the following sequence:
 - to avoid the impact;
 - if impact cannot be in total avoided, then to minimise and reduce the impact;
 - when an impact does occur, this must be mitigated and rehabilitated (restored); and
 - as a last resort, the option of an off-set must be considered in consultation with the Environmental Liaison Committee (ELC).

PLANNING PHASE: Feasibility studies and design (new infrastructure).

- All planning related activities to be subjected to environmental assessments, which must **take biodiversity related impacts**, bioregional and spatial planning **into consideration**.
- Not to increase the biodiversity impact within special nature reserves and national parks without an appropriate Environmental Assessment.
- **Not to build** new infrastructure **within “Important Bird Areas” (IBAs)** and or bird sensitive environments as identified through the Eskom-EWT strategic partnership, **without the prior engagement** with the appropriate environmental NGO stakeholders (**BLSA, EWT, WWF, etc.**).
- **Not to build** new infrastructure **within “Critically Endangered” biodiversity areas**, as defined within the bioregional plans (as gazetted), **without prior engagement** with the relevant stakeholders (**SANBI, Botsoc, DEA, SANParks, etc.**).
- All designs of power lines shall be wildlife friendly.
- Eskom will continue to support research in areas of biodiversity research.

OPERATING PHASE (existing infrastructure)

- All existing infrastructure must be monitored for potential biodiversity impacts during maintenance.
- All infrastructure that has the potential to impact wildlife (electrocution and collisions) must be reported, assessed and appropriate mitigation measures must be implemented.
- All Eskom-owned and/or controlled land shall be managed through an EMP that includes biodiversity related impacts.

Formation of the Eskom/EWT Strategic Partnership

- After numerous vultures were electrocuted during 1995 on an 88 kV powerline, studies revealed that bird mortalities on the Eskom electricity networks were much higher than originally envisaged.
- Eskom had an informal alliance with the Endangered Wildlife Trust (EWT), an environmental non-government organisation focusing on promoting the region's biodiversity.
- Eskom and EWT formalised their long-standing relationship by entering into a formal partnership at the end of 1995 to address the problem in a systematic manner on a national basis.
- Through the partnership, Eskom ensures that power is supplied without significantly impacting on South Africa's wildlife. The EWT fulfills its goal of promoting the conservation of southern Africa's biodiversity. It is a situation, where Eskom, the EWT, the people of southern Africa and the environment wins.

- Developed and implemented an effective reporting system to report and identify localities of negative bird interactions with powerlines
- Developed and implementation an investigation and monitoring system for negative interactions
- Established a database on negative interactions between birds and electricity structures to facilitate retrofitting and future design and placing of electricity networks and structures
 - EWT or ex-EWT employees (now in private practice) performs specialist avifaunal impact assessment on all new Eskom powerline projects to guide route and site selection.

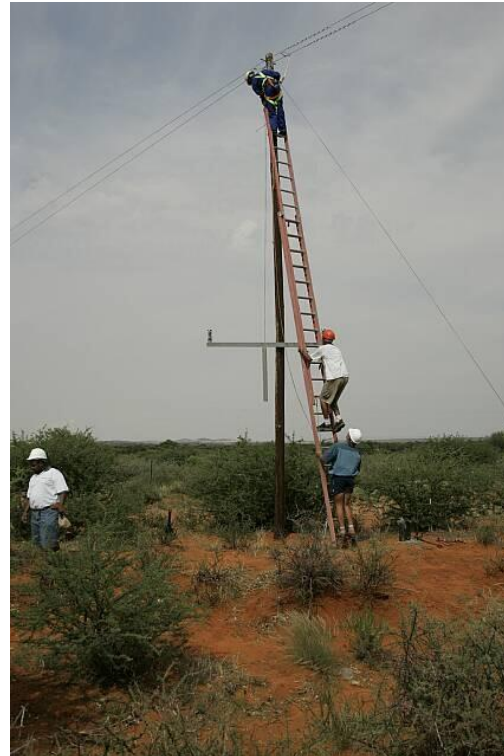
Key deliverables of the partnership

- Implemented an effective, ongoing awareness and training campaign to familiarize Eskom staff, field investigators and the general public with the partnership and wildlife interactions.
- Facilitate implementation and tracking of mitigation measures to minimise negative interactions
- Formally integrated wildlife interactions as part of the Eskom Research program.

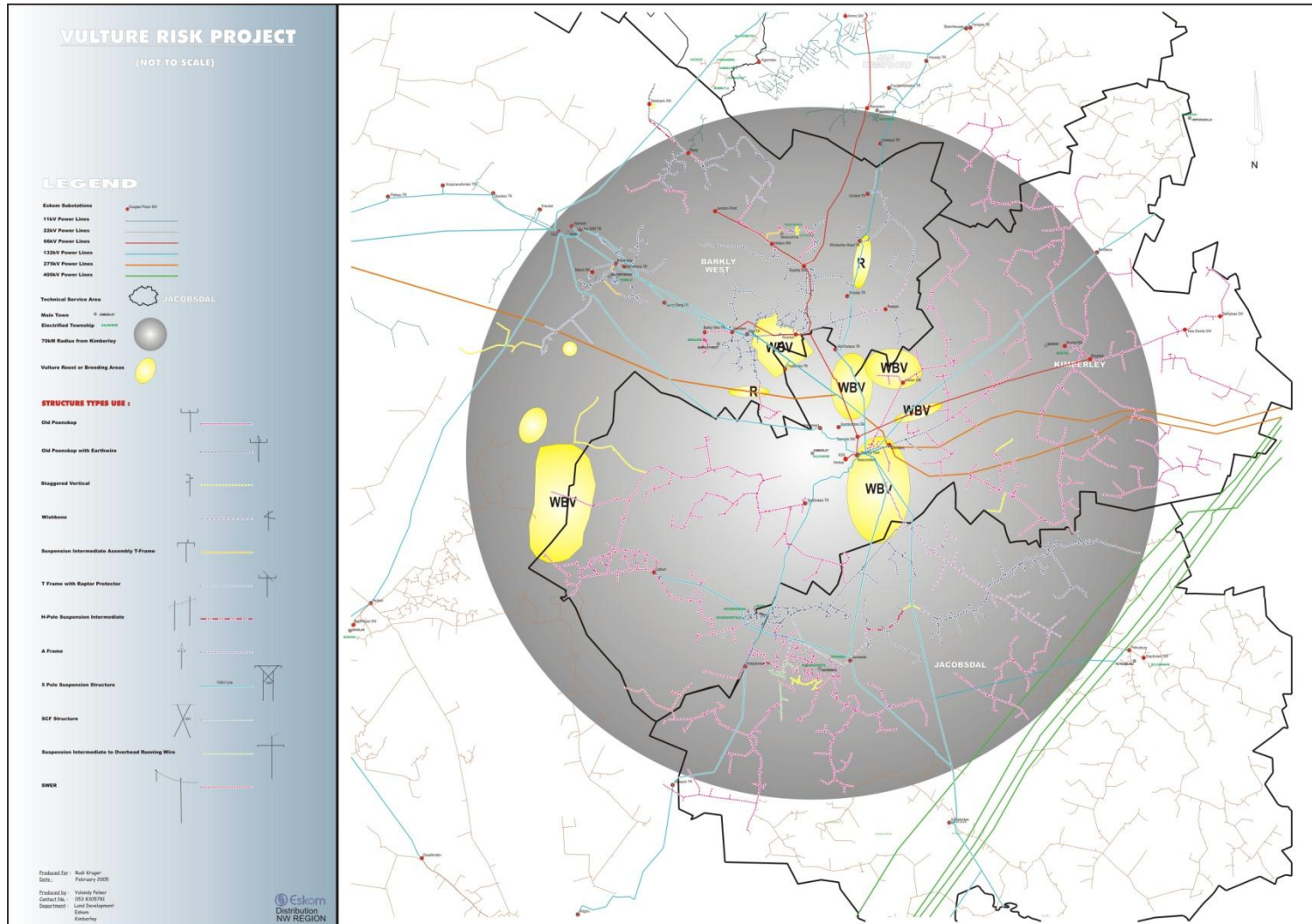
Wildlife interactions with electrical infrastructure - from 1995 to now...



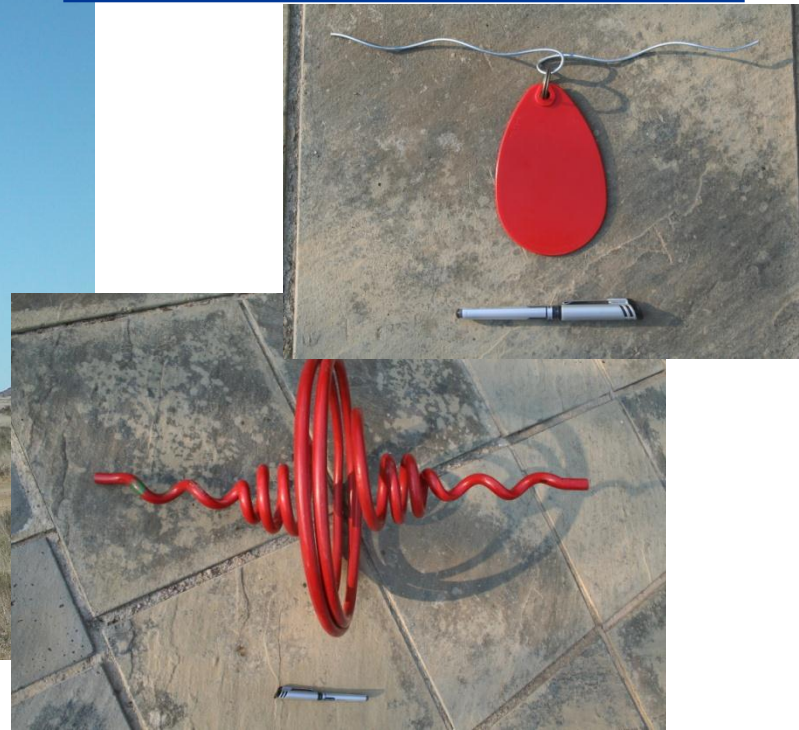
Some examples of the deliverables....



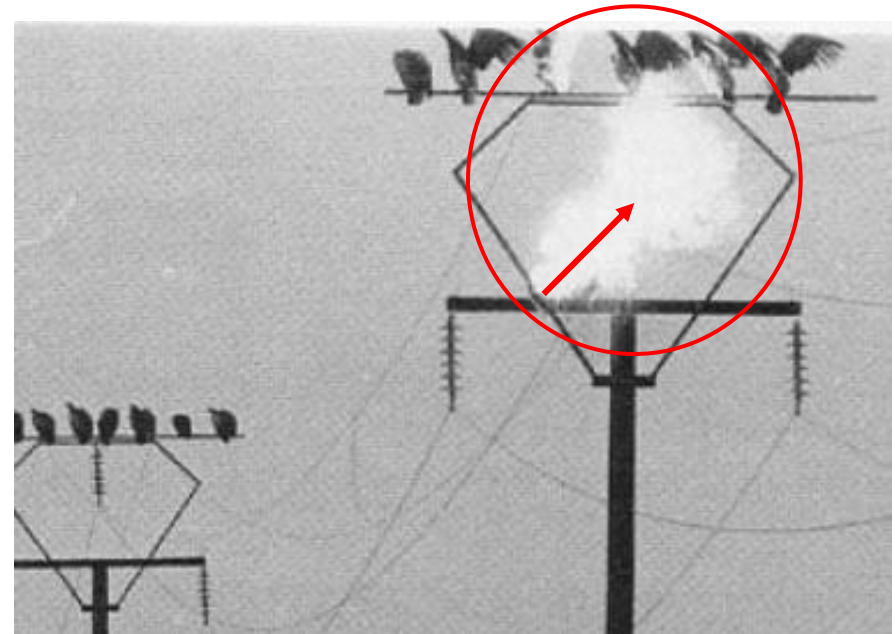
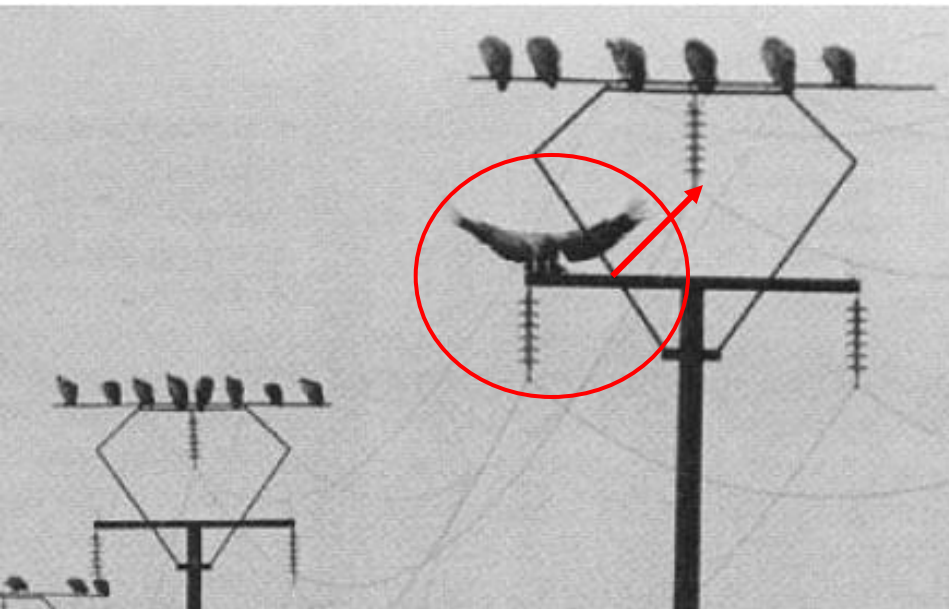
Research: Risk Assessment methodology



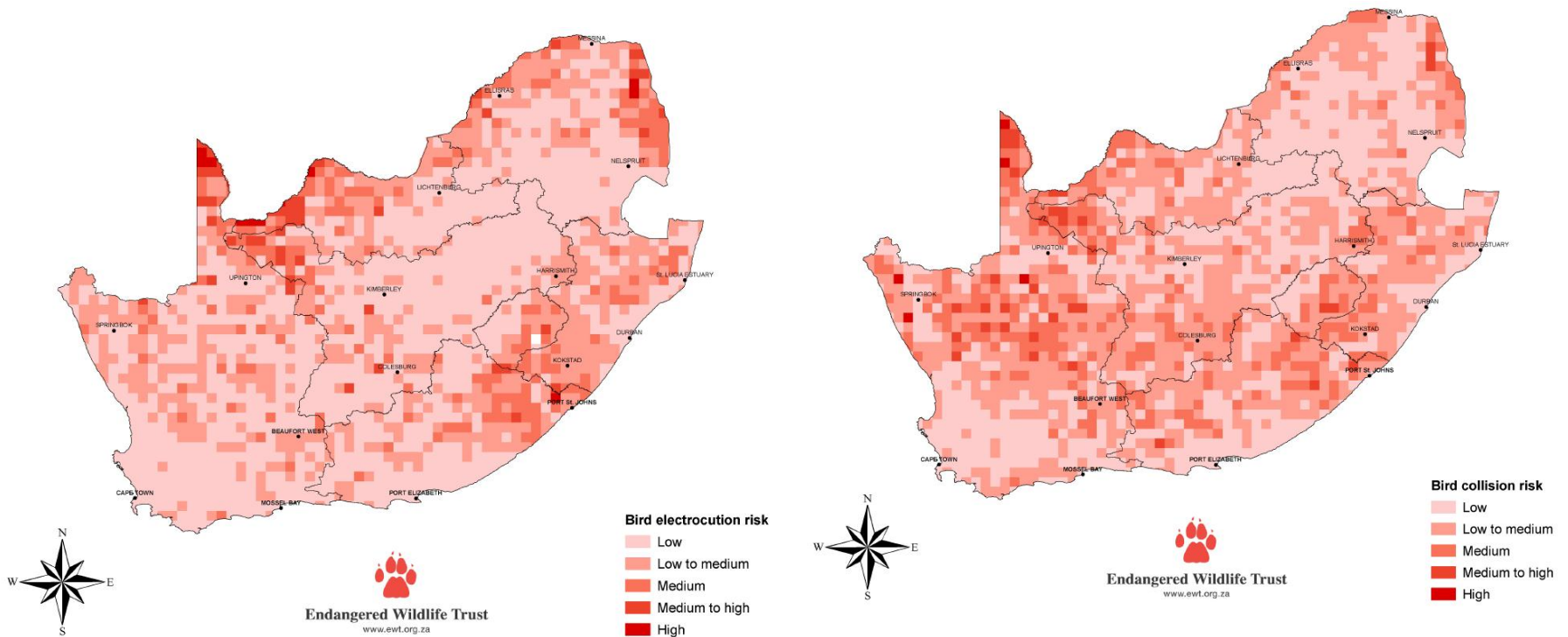
Research: Mitigation Products



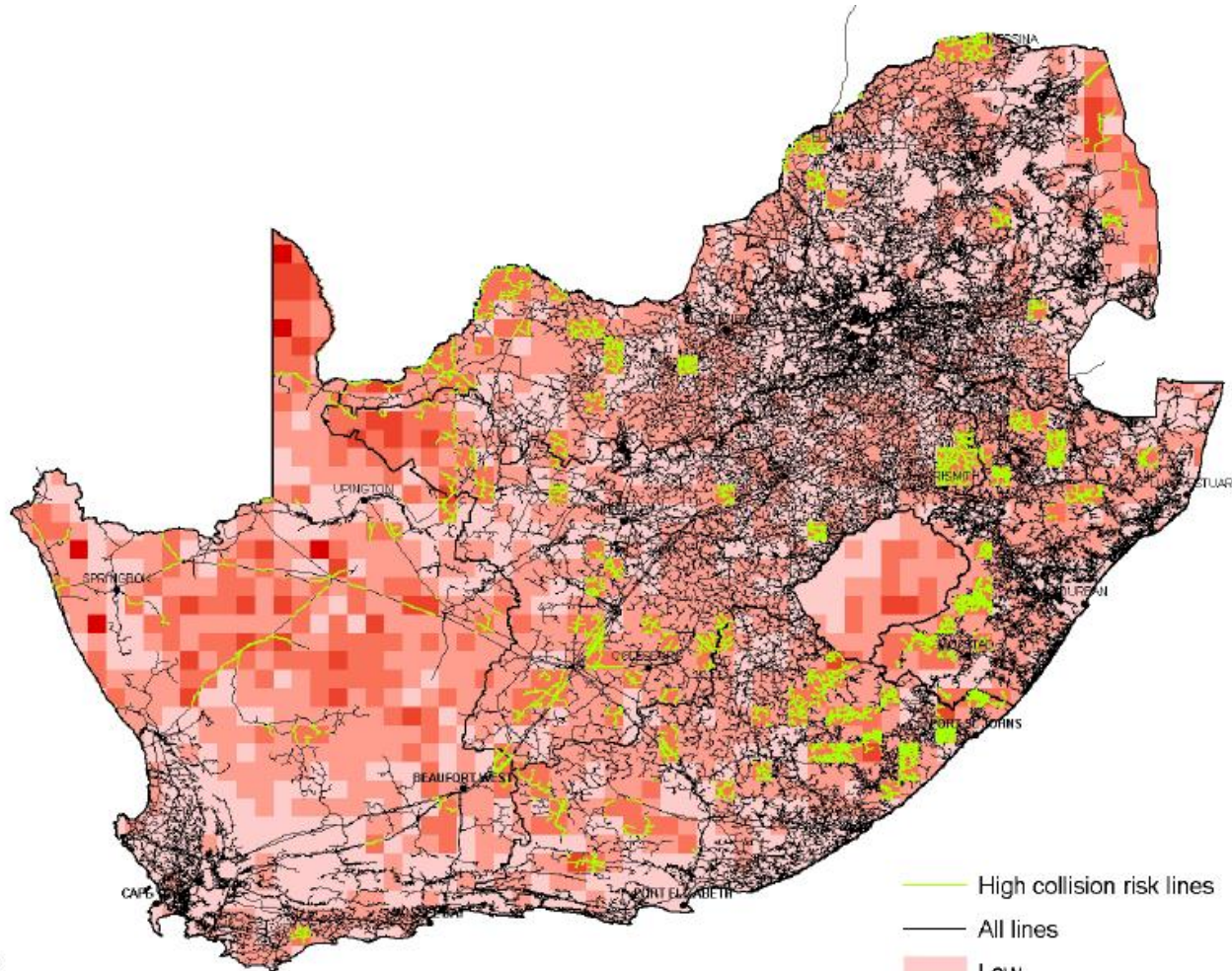
- Contact incident on Watershed-Slurry Structure



Research: Bird sensitivity maps



Collision risk of all powerlines



- High collision risk lines
- All lines
- Low
- Low to medium
- Medium
- Medium to high
- High



Birds & Powerlines

ESKOM/EWT PARTNERSHIP
TOLL FREE 0800 111 535
<http://www.eskom.co.za>
ESKOM ENVIRONMENTAL HELPLINE 0111 900-4727

E = electrocution
N = nesting **C** = collision
P = insulator pollution

BIRD STREAMER RESEARCH PROJECT



Bird streamers as a cause of faulting on transmission lines have relatively recently been identified as a major problem on the Eskom transmission grid. Streamers refer to long conductive streams of excreta produced by birds perching on transmission towers, that short circuit the electricity supply.

Two key research questions need to be answered :

- *What is the electrical conductivity and chemical composition of fresh avian excreta ?*
- *What is the range of lengths and diameters of streamers of a variety of species ?*

*These questions need to be answered in order to predict what species of bird could pose a risk to a variety of voltage sizes and configurations. The project uses an experimental set with Cape Griffons (*Gyps coprotheres*) for the experiments.*



CAPE GRIFFON EXPERIMENT

From the results of the Cape Griffon experiments, approximate values will be derived for other species that have been identified through observations in the field as likely streamer candidates. It is envisaged that further species specific research will be necessary to corroborate initial assumptions for a wide range of species. The bird streamer project is a joint initiative between Eskom, the Endangered Wildlife Trust and the University of Natal.



STREAMER EXPERIMENT

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ELECTRIC EAGLE PROJECT

Aerial survey



Investigations by a combined team of the Endangered Wildlife Trust, Eskom and the University of Cape Town proved that line faults are probably caused by long streamers of excrement, deposited on or near live conductors by roosting eagles near active nests.



Nest relocation

Line faults or power outages have been recorded on Eskom transmission lines in the Karoo. Indications were that Martial Eagles (*Polemaetus bellicosus*), Tawny Eagles (*Aquila rapax*) and Verreaux's Eagles (*Aquila verreauxii*) breeding on transmission towers could be responsible.

Nest removal was discarded as a viable solution due to the impact on the birds (both the Martial Eagle and Tawny Eagles are threatened species in South Africa) and because the birds will almost definitely continue to attempt to breed on the structures.

The Martial Eagle population of the central and southwestern Karoo is dependent on transmission towers for nesting, and constitutes about 20% of the national population. To eliminate streamer faulting, anti-perch devices are installed on selected towers and limited nest relocation to the waist of the tower has been recommended. The objective is to reduce eagle-induced outages while ensuring the continued tenancy of a threatened species dependent on transmission towers for breeding purposes.



Tawny Eagle on nest



Endangered Wildlife Trust



Strategic Partnership



Aerial survey

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KZN Vulture Mitigation Project

Eskom Distribution's Eastern Region has been experiencing ongoing quality of supply problems in KwaZulu-Natal (KZN). Preliminary field visits and reports by field staff indicate that the activity of vultures on Eskom infrastructure is a contributing factor.



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It has been difficult to manage the problem, due to the lack of information on vulture colonies, foraging areas and range, vulture feeding stations, etc. Furthermore, there have been a number of Cape Griffon (*Gyps coprotheres*) electrocutions and injuries on Eskom infrastructure in KZN. The goal of the project is to collate data relating to vultures in KZN in order to improve the management of vulture related negative interaction with Eskom distribution infrastructure.

A research report will be produced in 2004 with a description of potential interactions and vulture species involved, a map and tables indicating high risk sections of line identified on the basis of line design, expected interactions, foraging ranges, roosts and vulture feeding stations.



Electrocution Potential



Vulture density



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Key aspects investigated

- * Vulture distribution in KZN, especially the Cape Griffon
- * Number and location of vulture feeding stations in KZN
- * Foraging ranges
- * Distribution lines mostly likely to be impacted by vulture activities
- * Potential negative interactions in relation to specific line designs



Tower design drawing

Prior to the establishment of the Powerline Interaction Programme, the South African experience with regard to wildlife interactions and electricity structures was generally ad hoc, fragmented, inconsistent and poorly monitored. Poor co-ordination and integration of mitigation efforts, discontinuity and duplication of effort further exacerbated the problem. In view of the complexity, scope and persistence of the problem of interactions between wildlife and electricity infrastructure, Eskom, the South African national utility, and the Endangered Wildlife Trust (EWT) launched the Powerline Interaction Programme in 1996 to address these problems in a systematic, integrated manner.



Powerline Interaction Project

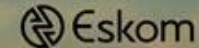


The programme focuses on the following:

- Maintaining a national incident register for all recorded wildlife mortality on electricity infrastructure
- Investigation of wildlife mortality and the provision of recommendations for the mitigation of electricity infrastructure.
- Research aimed at eliminating negative wildlife interactions with electricity infrastructure.
- Capacity building within Eskom and the Southern African Power Pool through dedicated training and awareness programmes.
- Special investigations into any aspect of wildlife interactions with electricity infrastructure.
- Bird impact assessment studies for proposed electricity lines



Endangered Wildlife Trust



Strategic Partnership

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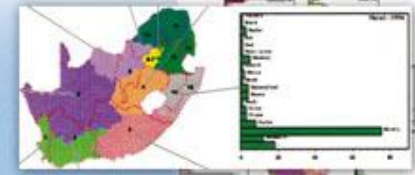
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Research



It was established that between 1981 and 1997, over 10 700 wildlife related incidents were reported on network performance systems.

These impacts affected a minimum of 136 533 customers. Among the biologically sensitive species implicated in the incidents were cranes, bustards, pelicans, flamingos, storks and raptors.

The findings of this study have played an important role in pointing the way for future research, resulting in the implementation of several research projects and subsequent programmes to limit wildlife mortality on powerlines.



Wildlife mortality: How big is the problem?

The issue of wildlife mortality on powerlines has two ramifications: the biological impact and the business impact. In 1997 an attempt was made by the Eskom Technology Group (currently the Resources and Strategy Group) to quantify the extent of powerline mortality on Eskom networks.

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TRANSMISSION BIRD COLLISION MITIGATION PROGRAMME

The problem of avian collisions with transmission lines in South Africa is well documented. Since 1996, the Endangered Wildlife Trust has kept a register of bird collisions with transmission lines through the mechanism of the Eskom-EWT Strategic Partnership.

Between 1996 and 2003, a total 248 bird collisions with Transmission lines were recorded, of which 74% comprised threatened species.



Bird collisions



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Key elements of this action plan are:

- Identification and prioritization of high risk transmission lines, using a GIS model that incorporates the distribution of 6 threatened species as primary criterion.
- Identification of sections of line requiring mitigation measures through physical inspection of high risk lines by vehicle and on foot.
- Marking of high risk sections of line with anti-collisions mitigation devices.
- Continual monitoring of applied measures to measure effectiveness through regular inspections
- Application of corrective measures if needed



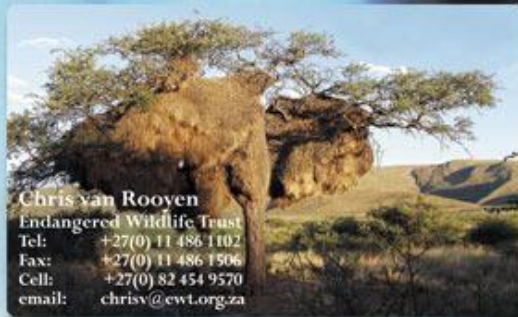
Anti-collisions mitigation devices

(Blippers)

Sociable Weavers Research Project



Sociable Weavers have expanded their range due to the use of artificial nesting sites, including electricity poles. Electricity poles form ideal nesting structures because they contain a strong horizontal support in the cross-arm, provide free access from below unobstructed by small branches and leaves and provide numerous crevices for the firm attachment of grass straws during nest building. The use of power line poles as nesting sites is having a negative impact on Eskom's ability to supply power reliably.



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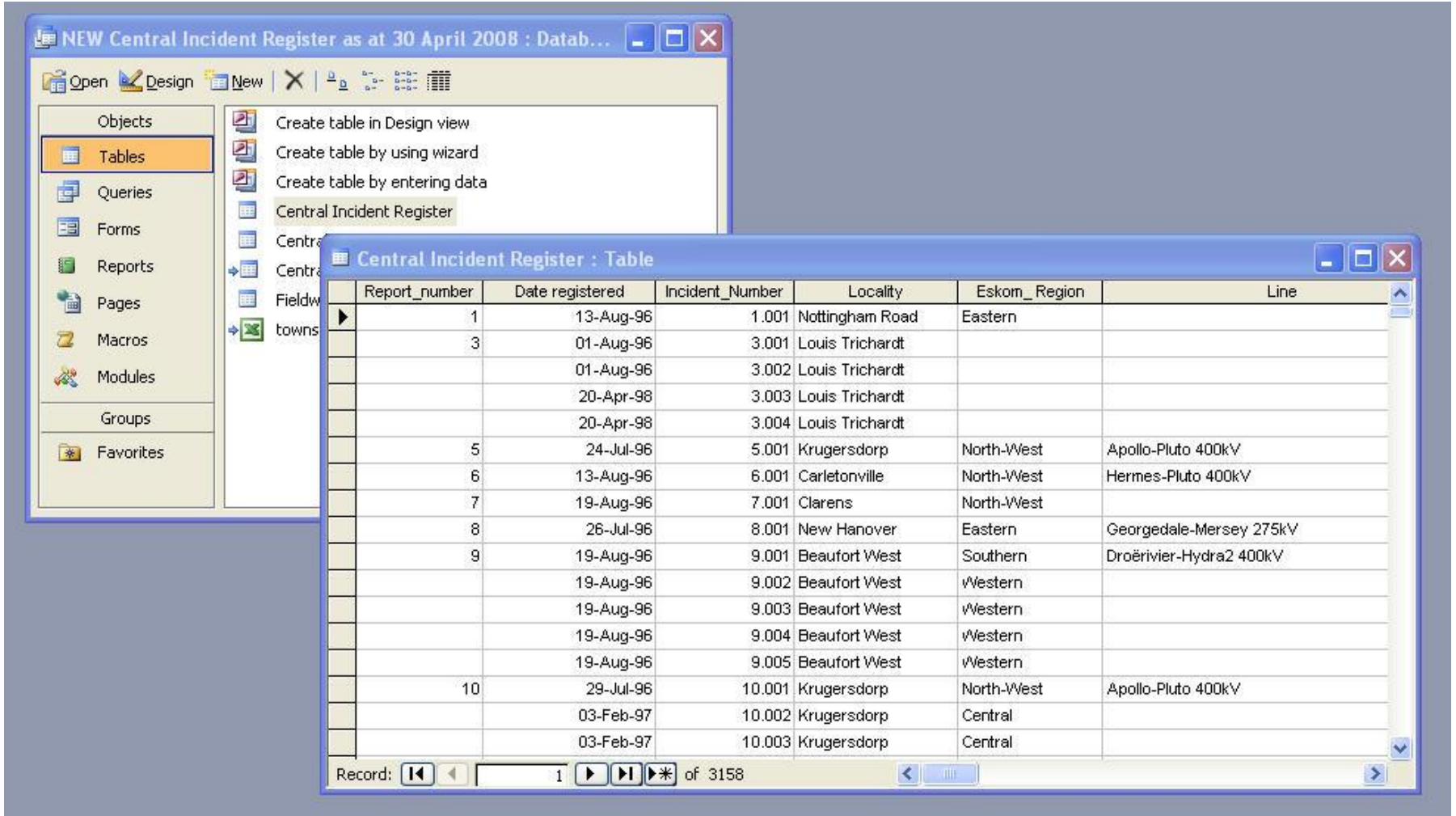
During rain, the nests cause phase to earth and phase to phase outages. During this process, insulators as well as cross-arms are damaged and veld fires may also result. A survey done in May 2001 identified the costs for repair, replacement and monitoring of Sociable Weaver nests on poles by two technical service centres in the Northern Cape to R746 568.00 per year. The results of this research showed that by moving the nest to a position below the cross-arm could minimize this problem. The costs of installing droppers to relocate the nest on each pole, amounts to just under R6 and takes about 6 minutes to complete. Once this is done, the sites only need to be monitored every 6 months to ensure that no new nests are initiated, and that the original nests are still in place on the droppers. This reduces the annual costs of monitoring the lines and replacing the damaged materials, to approximately R148 000. In addition, a reduction, if not total elimination of all related problems, such as veld fires, pole and conductor damage is achieved.



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 Endangered Wildlife Trust
 Eskom
Strategic Partnership

Incident register...



NEW Central Incident Register as at 30 April 2008 : Datab...

Open Design New

Objects

- Tables
- Queries
- Forms
- Reports
- Pages
- Macros
- Modules
- Groups
- Favorites

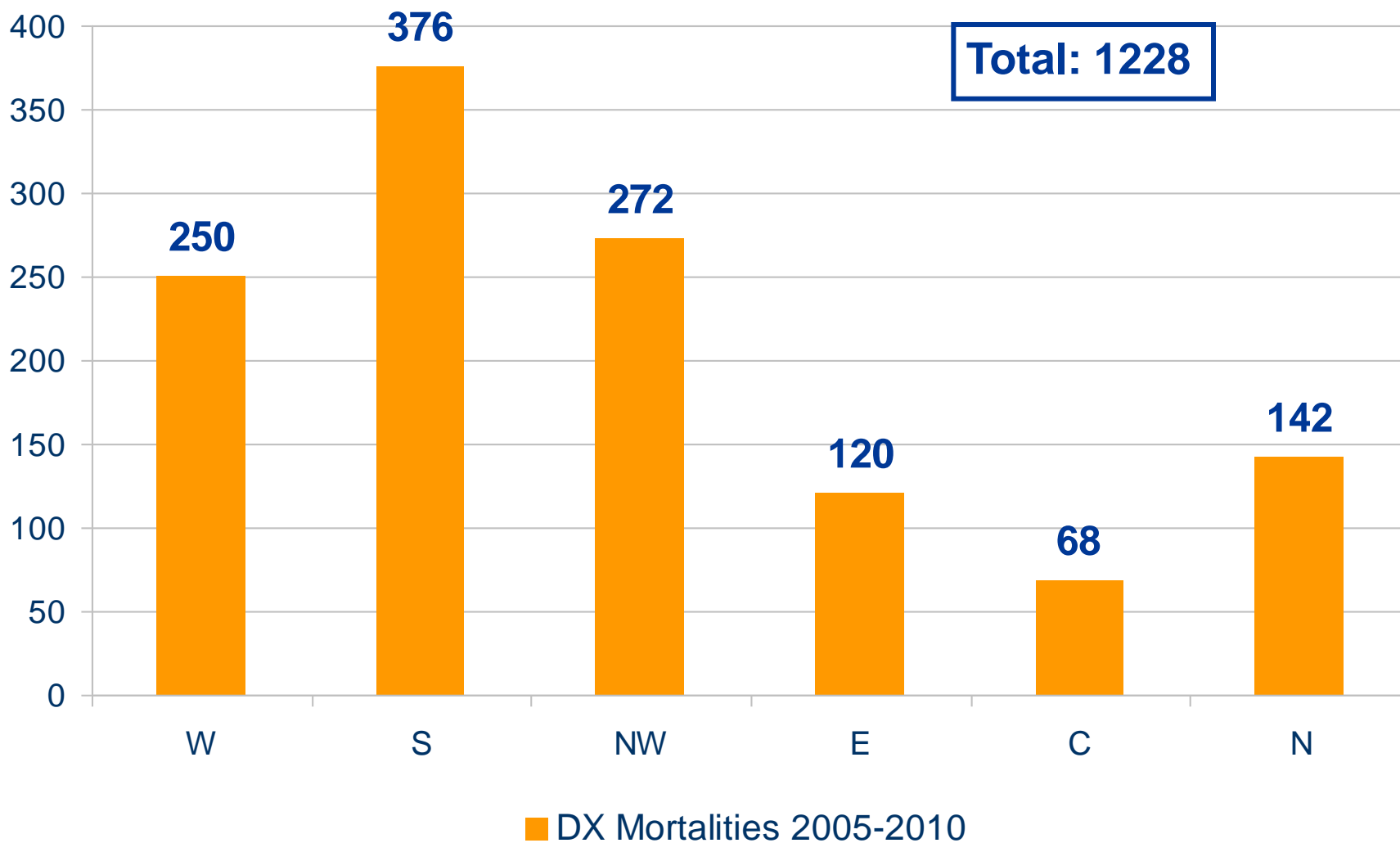
Create table in Design view
Create table by using wizard
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Central Incident Register
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Central Incident Register : Table

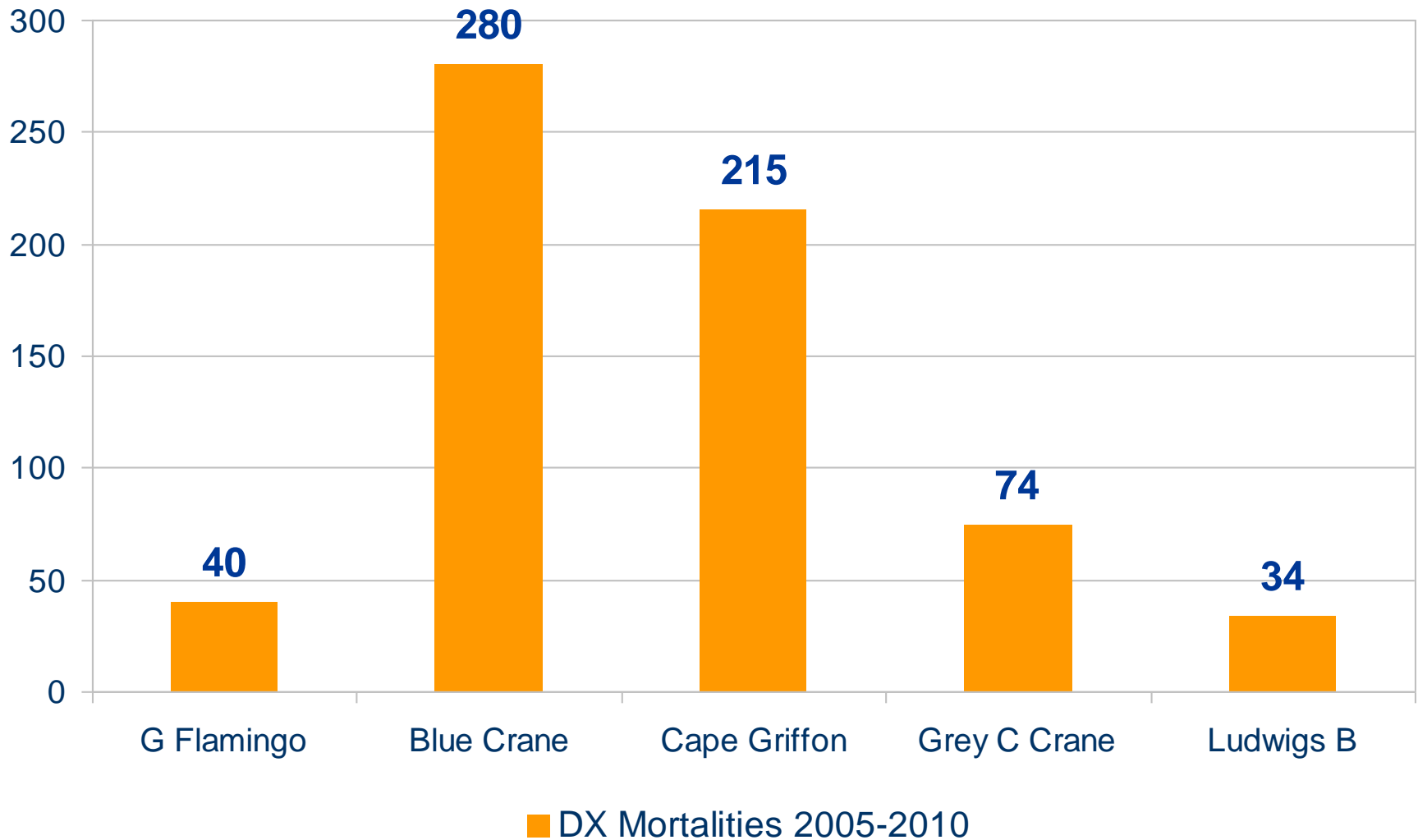
Report_number	Date registered	Incident_Number	Locality	Eskom_Region	Line
1	13-Aug-96	1.001	Nottingham Road	Eastern	
3	01-Aug-96	3.001	Louis Trichardt		
	01-Aug-96	3.002	Louis Trichardt		
	20-Apr-98	3.003	Louis Trichardt		
	20-Apr-98	3.004	Louis Trichardt		
5	24-Jul-96	5.001	Krugersdorp	North-West	Apollo-Pluto 400kV
6	13-Aug-96	6.001	Carletonville	North-West	Hermes-Pluto 400kV
7	19-Aug-96	7.001	Clarens	North-West	
8	26-Jul-96	8.001	New Hanover	Eastern	Georgedale-Mersey 275kV
9	19-Aug-96	9.001	Beaufort West	Southern	Droërivier-Hydra2 400kV
	19-Aug-96	9.002	Beaufort West	Western	
	19-Aug-96	9.003	Beaufort West	Western	
	19-Aug-96	9.004	Beaufort West	Western	
	19-Aug-96	9.005	Beaufort West	Western	
10	29-Jul-96	10.001	Krugersdorp	North-West	Apollo-Pluto 400kV
	03-Feb-97	10.002	Krugersdorp	Central	
	03-Feb-97	10.003	Krugersdorp	Central	

Record: 1 of 3158

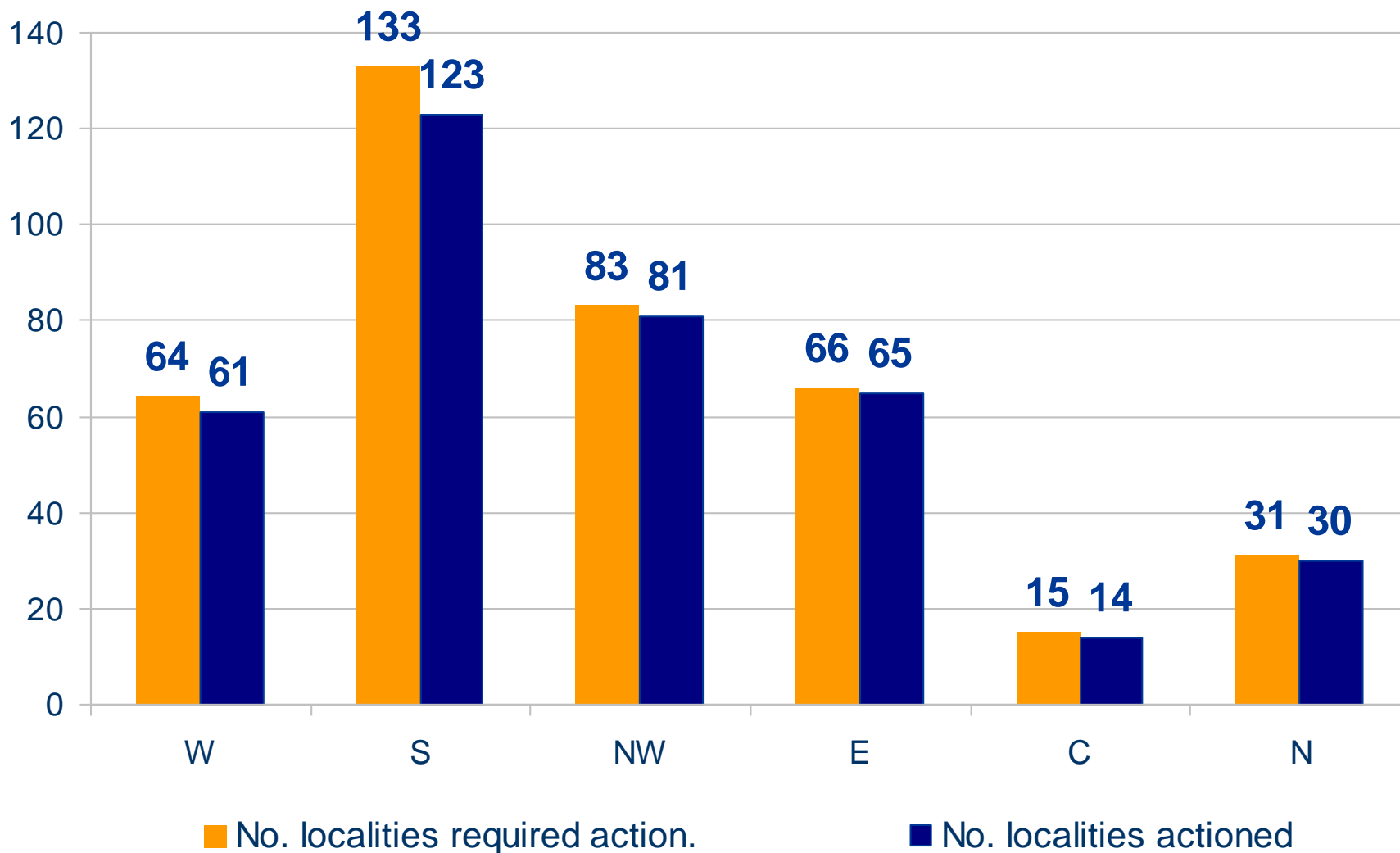
Management information extracted from incident register...



Eskom Distribution Division ($\leq 132\text{kV}$): Species mortality: 2005-2010 (reported)

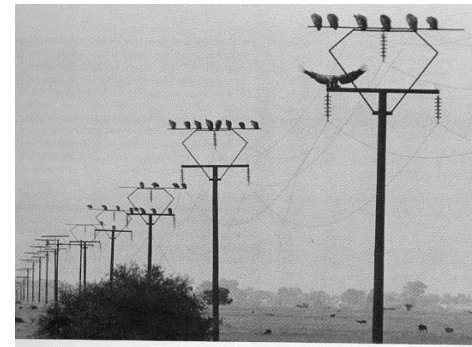
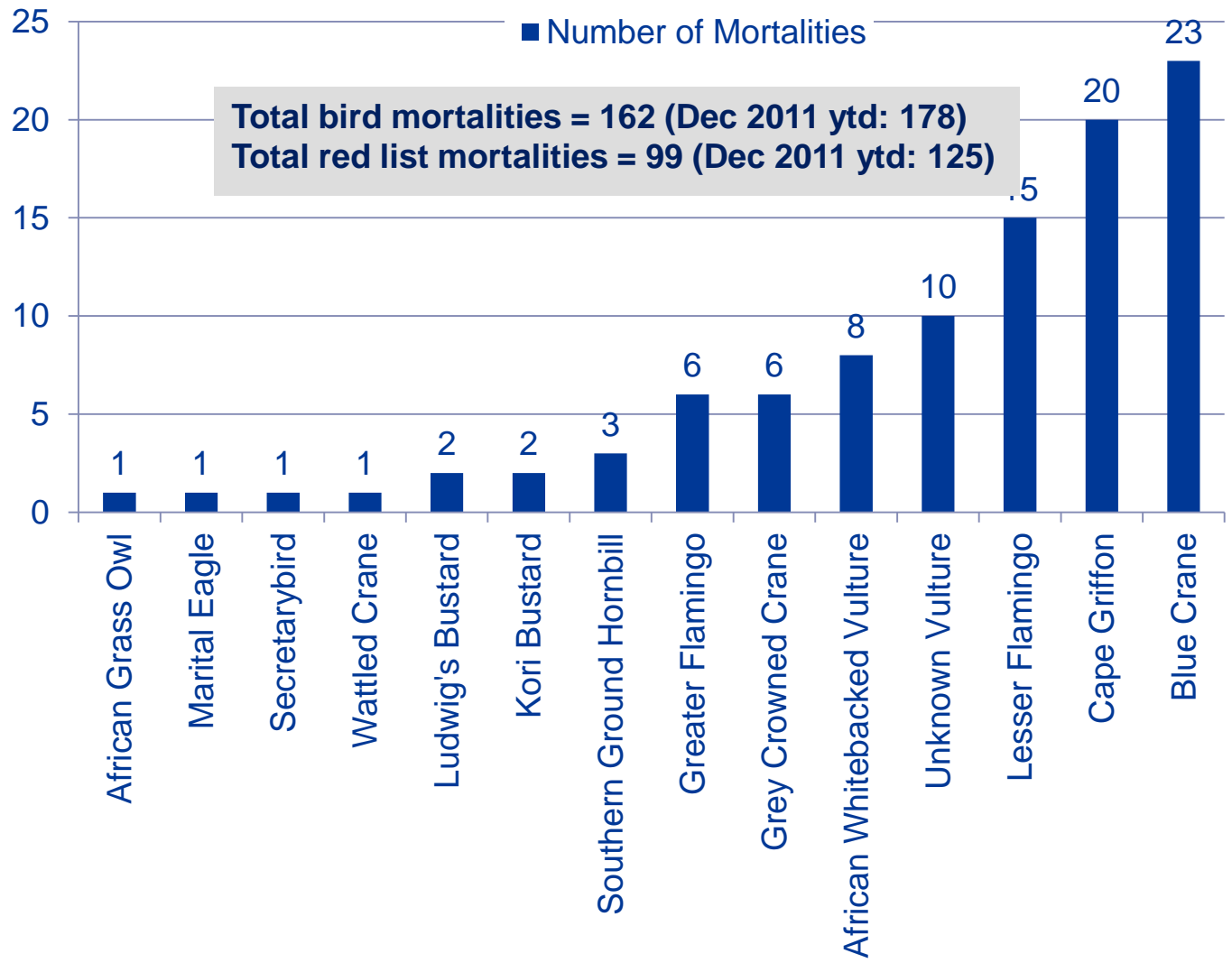


Number of DX localities requiring action vs. localities actioned (2005-2010)



Protected bird mortalities: 3rd Quarter year-to-date (YTD)

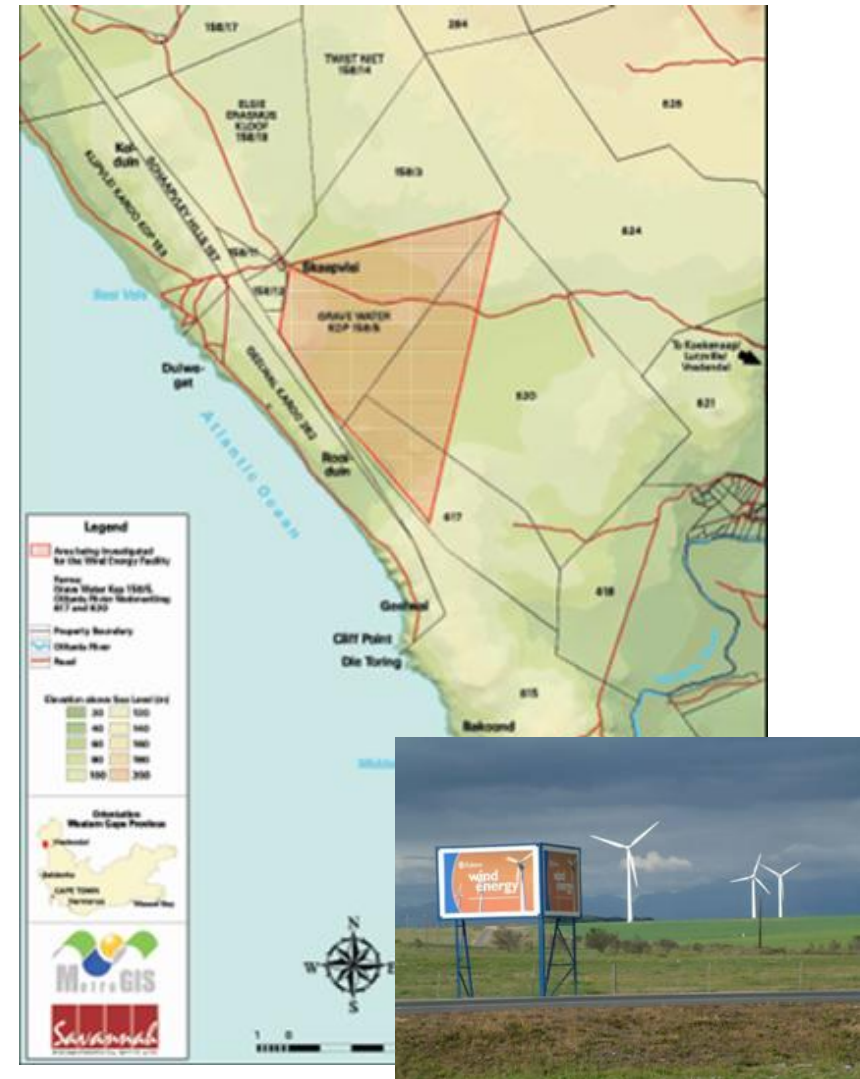
Number of Red List Bird Mortalities April - December 2011



Eskom has a long standing relationship with BirdLife SA (BLSA)

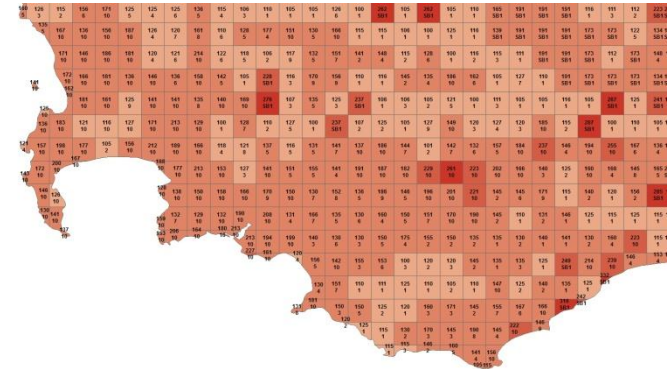
- Currently funding BLSA to update the so called *"The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland"* publication.
- This publication is well known by all those involved in avian studies, science, protection and conservation. It shapes government policy on species protection, used in EIA studies and determining areas for protection and is both nationally and Internationally recognised scientific publication.
- Eskom is participating in The Birds & Wind Energy Specialist Group, convened by the EWT and BLSA, on proposed guidelines and monitoring protocols for evaluating wind energy development proposals in southern Africa, which is documented in *"BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa"*.

- Demonstration plant of 3.2MW
- Projects in progress:
 - Sere 100MW
 - Kleinzee 300MW
 - Aberdeen 200MW
- All above projects followed full EIA process with specialist biodiversity assessments



Way forward: Project based approach to identify and evaluate impact of wind generation on avifauna

- Macro scale assessment of sensitive areas
e.g Using Avian Wind Farm sensitivity Map
- Micro scale assessment prior to construction
 - Observation & collection of quantitative data on bird movement on site critical
 - Seasonal representation
 - Collision risk modeling
- Standardization across projects
 - Best practice guidelines for preconstruction assessment & post construction monitoring
- Impact of associated infrastructure connecting to the grid must be part of Macro and Micro assessment (holistic approach)
- Post construction monitoring at operational sites



- Extensive body of knowledge built up over the past 16 years through the Eskom/EWT partnership
- Biodiversity considerations integrated into all phases of the Eskom project life-cycle
 - Detailed biodiversity assessments and specialist avifaunal studies conducted for all Eskom wind energy projects
 - Studies guided by bird sensitivity maps and input from ornithological experts and site specific studies
 - Above studies guide siting and route selection including that of associated infrastructure
 - Post construction monitoring formalised to report, investigate and implement mitigation measures where possible
- Formal partnership with EWT allows networking and having access to biodiversity specialists
- Networking with other NGOs like Birdlife South Africa is a critical success factor.

Acknowledgements

- Megan Diamond – Endangered Wildlife Trust
- Constant Hoogstad – Endangered Wildlife Trust
- Dave Lucas - Eskom



Thank you!