FIFTH ANNUAL REPORT:
THE ENVIRONMENTAL RESEARCH REGISTER (ERR) FOR THE 2022/23 FINANCIAL YEAR

GAUTENG PROVINCE
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

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ABBREVIATIONS AND ACRONYMS

ACE	**Africa Centre for Evidence**
APP	**Annual Performance Plan**
COJ	**City of Johannesburg**
COP	**Community of Practice**
CEE:	**Centre of Environmental Education**
DFFE	**Department of Forestry, Fisheries and the Environment**
DWS	**Department of Water and Sanitation**
EAPS	**Environmental Assessment Practitioners**
EPPC	**Environmental Policy Planning and coordination**
ERR	**Environmental Research Register**
GCRO	**Gauteng City-Region Observatory**
GDARDE	**Gauteng Department of Agriculture, Rural Development and Environment**
GERS	**Gauteng Environmental Research Symposium**
GHG	**Greenhouse Gases**
GP	**Gauteng Province**
GPG	**Gauteng Provincial Government**
GTAC	**Government Technical Advisory Centre**
HOD	**Head of Department**
KPI	**Key performance indicator**
NGO	**Non-Governmental Organization**
PEETS	**Process, Energy & Environmental Technology Station**
SDG	**Sustainable Development Goals**
TMR	**Transforming, Modernizing and Re-Industrializing**
UJ	**University of Johannesburg**
UNEP	**United Nations Environment Programme**
UNFCCC	**United Nations Framework Convention on Climate Change**
UNSG	**United Nations Secretary-General**
WEF	**Water Energy Food nexus**

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EXECUTIVE SUMMARY

The Gauteng Environmental Research Register (ERR) is a living document that is updated annually. The information contained in the ERR is peer reviewed by an external institution (UJ CEE and PEETS). The register was developed in the 2017/18 financial year to respond to the need to have a reporting tool on environmental research that is conducted in Gauteng Province. It was initiated by the Gauteng Department of Agriculture, Rural Development and Environment's directorate - Environmental Policy Planning and Coordination.

So far it has achieved the following milestones amongst other:

- The ERR contains studies that are included in the South African environmental evidence map by DFFE. Hence the capturing of studies is in line with the DFFEs parameters.

- The information on the database is shared with climate change mitigation unit for extraction of information that helps them report to the National climate change response database.

- The whole database has been peer reviewed where UJ CEE lead the process of verifying each study that was contained in the 2022 approved report to check for relevance and whether it fitted within the set.

  parameters. As a results over 50 were excluded from the database.

- The ERR is hosted on the UJ PEETS website. The page is live and accessible by the general public as it is a government institution hence promoting information sharing and creates opportunities for collaborations and partnerships.

- Development of the APP that contains all the studies that are captured in the ERR.

- Approval of reports:
  The first annual report approved in March 2019; the updating and maintenance of the database then commenced after the first approved report, with the second annual report approved on the 20th of June 2020, the third annual report was approved on the 15th

of February 2021, the fourth annual report was approved on the 23rd of March 2022.

- Policy relevance:

  The studies that are presented in the ERR have been classified according to their level of influence in terms of the various policy stages, these include: Diagnose & assessment; Planning & design; Implementation; and Evaluation.

- Online

  Documents that could not be accessed without prio approval from the institutions have been downloaded and put in online sources (google drive) to ensure that they have a link and can be accessed easily.

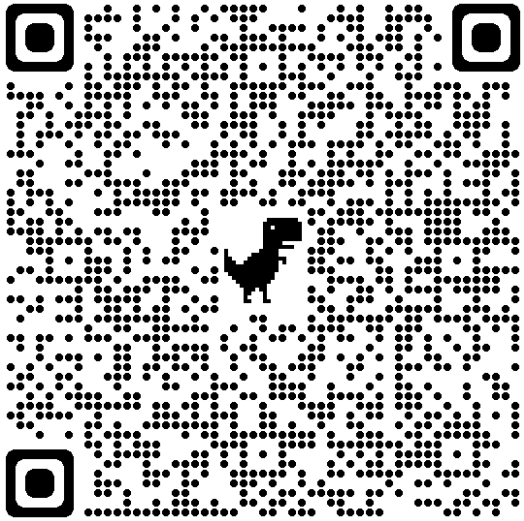
- Benefactor column added

  The focus areas column has been replaced by the the field of study / benefactor column to clearly depict the target audience for the particular research work carried out.

The register has proven ability to assists in selection of research topics and KPIs, providing pointers of the already existing information/ data and highlights the niche areas that researchers can focus on in order to have a greater impact as well as provided more effective implementation of research outcomes that would otherwise be shelved and unknown to the greater audience.

https://www.appsheet.com/start/904382a8-48f4-4c4b-ba06-44fd015421a2
on the browser and for downloading of the APP https://www.appsheet.com/newshortcut/904382a8-48f4-4c4b-ba06-44fd015421a2
The legal aspects of putting the APP store on play store, i-tune stores etc. are still to be done through the departments Legal directorate.

The QR code for accesing the ERR APP is pasted below and can be used on any device that has access to the QR code scanner:



For better understanding of the conceptualisation of the idea of the ERR, the approved concept note is attached. The user manual is also attached to explain the rationale regarding the different columns used and to guide the user on the information that they can expect to find in the database. It is important to note that this is a generic report on the overall findings of the data collected hence it can be further analysed to generate customised reports that are relevant to different professional and academic fields.

As such the ERR does not only serve as a benchmarking tool, but it also serves as a monitoring & reporting tool to capture data and to produce reports on research carried out by various institutions.

In light of the above , it can be deduced that the ERR is a living document that presents environmental studies carried out in Gauteng Province from 2007- to date.

1. PURPOSE

The aim of this report is to serve as a fifth annual report of the Gauteng Environmental Research Register (ERR) and provide progress of the database since the approval of the fourth annual report in 2022 by the Head of Department, Gauteng Department of Agriculture and Rural Development (GDARD) as the designated accounting officer, Ms. Matilda Gasela.

This project is part of Gauteng Department of Agriculture and Rural Development (GDARD)'s Operational Performance Plan for the 2022/23 financial year, under the Environmental Policy, Planning and Coordination (EPPC) Directorate.

2. BACKGROUND

The primary objectives of the ERR can be noted on the attached concept note, however they have been modified to ensure relevance and can be summarised to be as follows:

- To continually update and maintain a database that can be used as a benchmark for researches conducted in Gauteng province to support government, research institutions, private sector and Non-Governmental Organisations (NGOs);
- To provide essential information to decision makers;
- To track information required by different statutory bodies and stakeholders;
- To provide annual progress reports to the provincial government departments regarding the number of environmental research projects undertaken;
- To ensure that the research data and reports are saved on the departmental server and accessible to all stakeholders; and
- To facilitate research collaboration between various research institutions and provincial government.
- To ensure that the data and reports are saved on the departmental server and or be hosted in a public domain to ensure easy access by the public and potential users.

The ERR is being updated and refined internally on a regular basis to include up to date studies as well as ensure that it effectively serves the purpose that it was established for as explained above.

It can assist in generating Key Performance Indicators (KPIs) reports, annual reports and departmental media releases as well as helping researchers to identify relevant new research areas that can support government decision making.

Reporting can be done on all information that has been captured such as:

- Researcher profile (names, contact details, the institution that they are affiliated with, etc.)
- The title and nature of the research work,
- Geographic location of the study,
- Intended impact of the study,
- Types of source used for disseminating research outcomes,
- The type of outcomes.

Below is information on what to expect in the new report, what areas can be improved on as well as a detailed explanation of the process of the creation of the ERR and how the ERR is currently looking.

3. WHAT'S NEW IN THE 2022-23 VERSION OF THE ERR?

3.1 The APP

The ERR has matured from being developed to being maintained through adding new studies and having annual reports drawn from analysing the data contained in it.

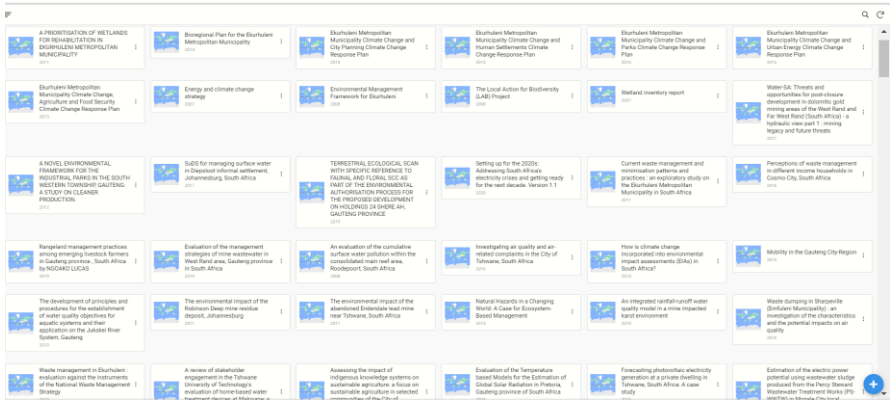
It has also improved in a sense that it transitioning form just being a desktop database to being a fully fledge APP that can be easily accessed through devices such as cell phones and tablets. The links to access the APP are as follows:

Browser: https://www.appsheet.com/start/904382a8-48f4-4c4b-ba06-44fd015421a2

Installer:
https://www.appsheet.com/newshortcut/904382a8-48f4-4c4b-ba06-44fd015421a2

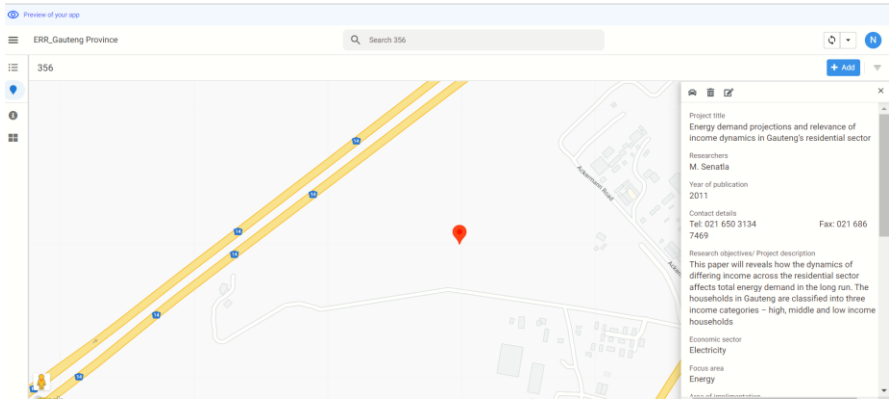
The improvement of the columns and the data contained can be noted as follows:

The data has been verified during the capturing into EPPI reviewer by UJ and GDARDE.

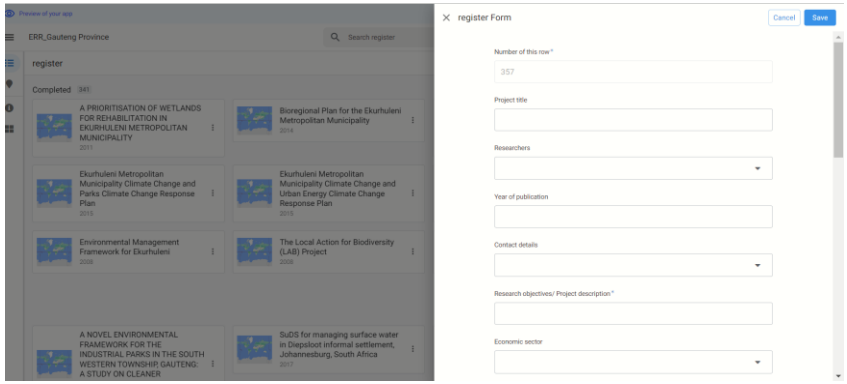


Picture 1: The landing page of the ERR's studies on the APP.

In future studies will be captured simultaneously on the APP and cloud (one drive) to ensure consistency of the databases. An added benefit of the APP is that it has an option to post geo-spatial coordinates of the study.



Picture 2: Geo-spatial location of the studies together with the information on the study as presented on the APP.

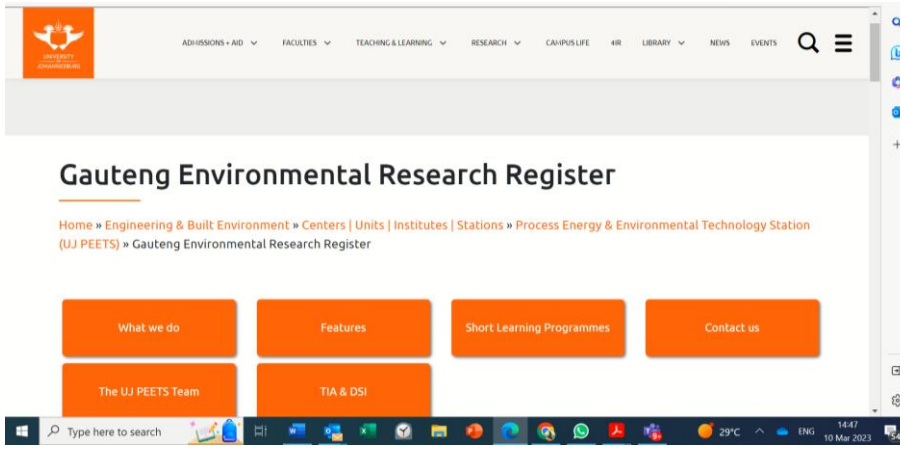


Picture 3: The add information page of the ERR APP.

3.2 Hosting of the ERR on PEETS website

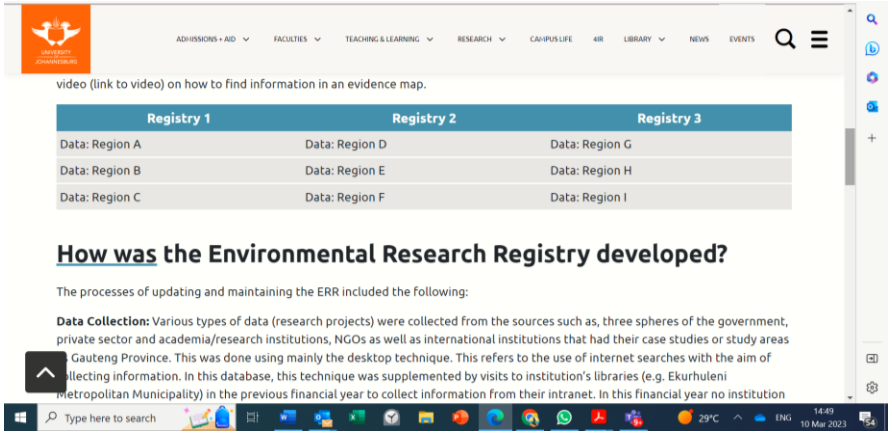
Through the implementation of the MoA with UJ, the Gauteng ERR has found its way to being hosted in the institution's website.

A quarterly reporting of the amount of viewers and interactions with the website will be given, therefor being captured in the next annual report.



Picture 4: A representation of the web page of the ERR.

The link to access the website is as follows ERR page.



A lot of work has been done in ensuring that all the relevant databases and approved reports are in place for accessing by the public. Hence promoting the bathopele principles of information sharing and transparency. A query form was also designed and put on the webpage for follow ups.

3.3 Coding of the ERR on EPPI reviewer

As mentioned above, there has been a series of coding of the ERR on the EPPI reviewer through the use of UJ CEE software.

The process of coding was led by the CEE director Dr C van Rooyen. She led the development of the evidence map for DFFE hence the information that was added in the data collection process included previous studies captured in the ERR and similary with the updating of the studies on this version of the ERR included capturing studies that appear on the map and were not previously present together with other supplementary data.

Evidence mapping is a novel method of evidence synthesis that has received increased attention in recent years. While systematic maps of research evidence have long been part of Systematic Reviews and meta-analyses, the value of evidence maps in their own right has grown hand in hand with attempts to increase the policy-relevance of evidence syntheses. Before 2010, only 10 published evidence maps could be identified internationally, compared with 11 published in 2014 alone—an indication of the growing application of the approach. Evidence mapping aims to transparently assess and structure what evidence has been generated in relation to a specific research question in order to identify patterns and gaps in the evidence-base. Evidence maps follow the accepted and explicit stages used in the conduct of systematic reviews. These stages and their quality controls ensure rigour and transparency in the research process and are common to all methods of evidence synthesis. As such, evidence maps present a tool to generate a systematic and transparent overview- most commonly in visual format- of a body of evidence, which has been identified through an exhaustive search and subjected to a structured and rigorous coding and critical appraisal process.

These research steps consist of:

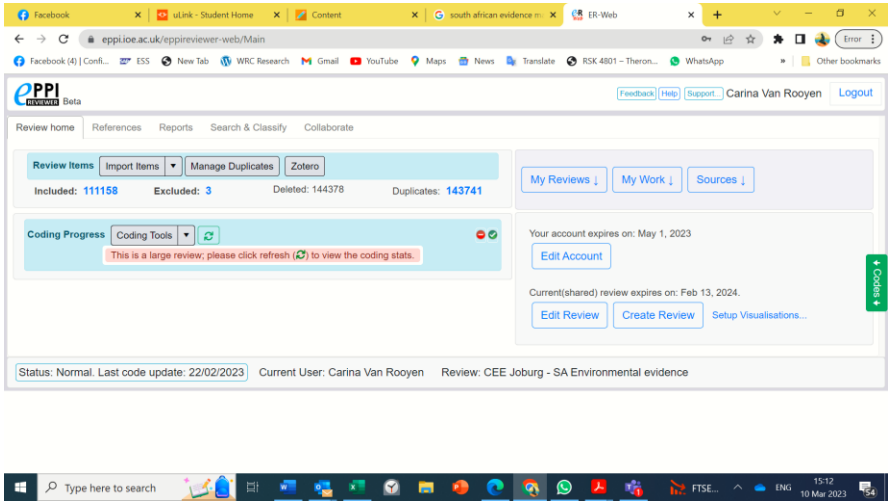
1. Designing explicit inclusion criteria regarding what evidence will be featured in the map;

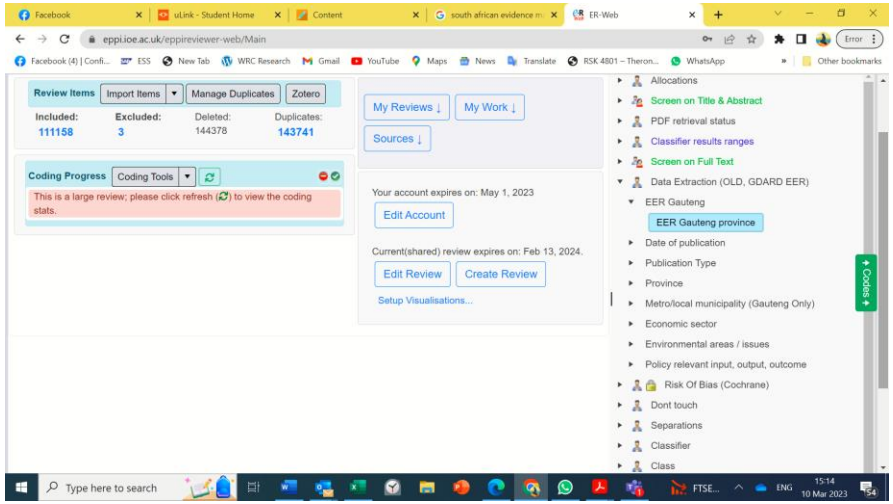
2. Conducting a systematic search for all available evidence;

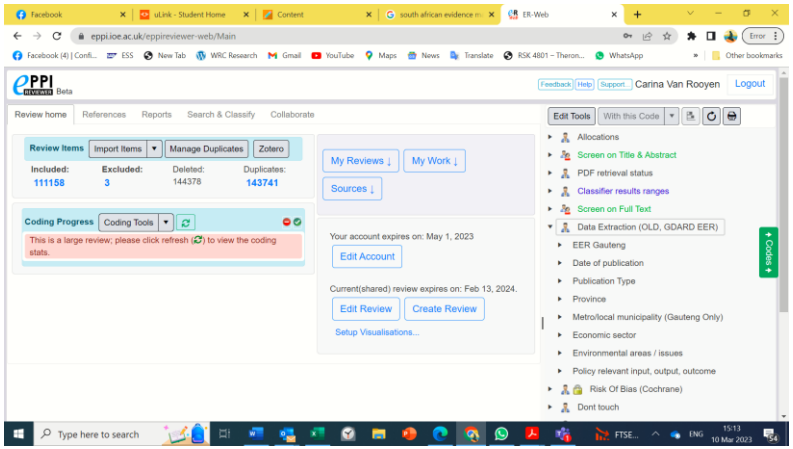
3. Employing a structured coding and categorization of the identified evidence;

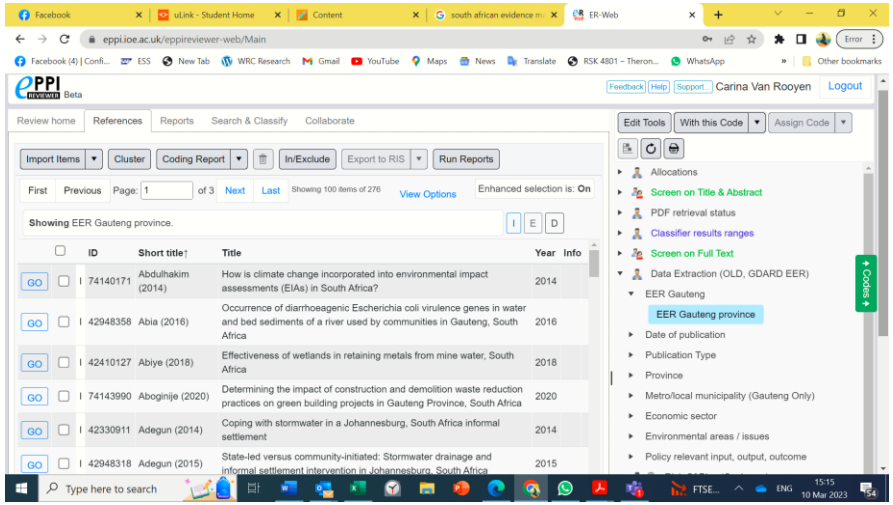
4. Critically appraising the evidence; and 5. Presenting the evidence map visually.

The below images summaries the coding process that was undertaken to capture the information into EPPI review.









4. Discusion of the 2022/23 fy ERR

The Gauteng Environmental Research Register (ERR) was developed in the 2017/18 financial year to respond to the need to have a reporting tool on environmental research that is conducted in Gauteng Province, hence becoming a benchmarking tool for studies carried out in the province.

Not only does it present the studies to Gauteng Provincial Government officials (GPG) but it has a proven record of being requested and used for academic purposes The ERR not only allows the Gauteng City Region based researchers with easy access and but also assists external stakeholders who need background information on specific subject matters. The intended beneficator column has been added to direct the users to find the information that has been identified as crucial to the subject or rather focus area of the studies presented.

According to Project Management Institute (2014) the advantages of having a centralised database includes allowing for minimized data redundancy; creating consistency; file-based systems create data redundancy, etc. Kerzner (2005) supports this notion by stating that a centralised database reduces conflict in saturated research areas and helps to shift focus to areas where there is a need for more knowledge.

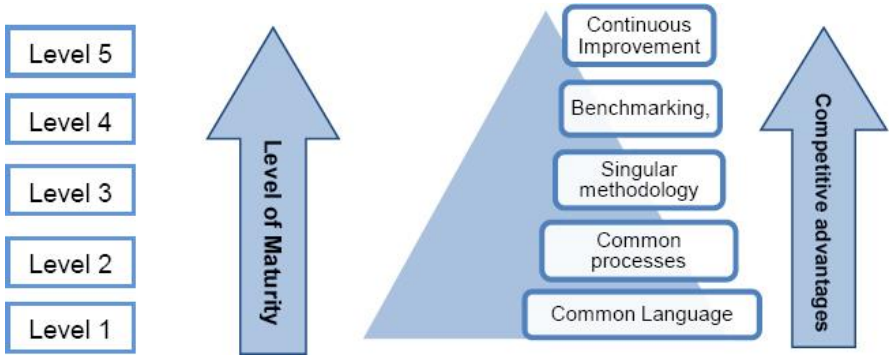


Figure 1: Kerzners's Maturity Level (2005)

From the figure above it can be deduced that having a centralised database ensures that there's a common language in this case the ERR classifies like for like and merges the studies to an easy to understand language. The process followed in the compilation, updating and mantainance of the database is transparent and easy to follow; the fact that the register dates back to 2007 it makes it fit into the benchmarking categories and can be used to

showcase the shift in focus areas that research has taken and lastly for the contineuos improvement field this is obtained from the annual updates and updating.

From the above, it can be noted that the ERR assists in identifying research areas, as well as making it easier to share and follow up on findings within the research community. However, any centralised database has the risk of loss when it is maintained within an individual institution, as well as ongoing costs for the hosting body. To reduce the above risk and to ensure greater exposure and wider use of the ERR, the hosting of the ERR by the University of Johannesburg is being discussed. The Memorandum of Agreement for hosting and other mutually beneficial activities has been approved on 27 January 2021.

The information captured on the ERR, is as follows:

- Project title;
- Names of researcher(s);
- Year of publication;
- Economic sector (i.e. standardised economic sectors as per the National GDP);
- Benefactor or area of focus (i.e. Agriculture, Air Quality, Disaster management, Ecological research: Biodiversity, Ecological research: Ecosystems, Energy, Environment, GIS, Health, Industries, Infrastructure, Mining, Transport, Waste, Water, 4IR & Innovation, Sustainable development)
- Area of implementation;
- Geographic area (i.e. The municipality in which the project/study focused on);
- Status (i.e. completed, ongoing or discontinued);
- Accessibility of the project (i.e. yes or no);
- The output source (i.e. Journal, Institution's online library, Map, Government publications, forum/ seminar/ conference, other website/ online source);
- Output type (i.e. Paper in Journal, Thesis, Government report, Research Report, Conference proceedings, policy/ strategy/framework, survey, paper in website);
- Link to abstract or research study/ name of source.
- Policy stages that the study can contribute to.

4.1. METHODOLOGY

The process of updating the ERR included the following:

a) Data Collection

Various types of data (research projects) were collected from the sources such as, three spheres of the government, private sector and academia/research institutions, NGOs as well as international institutions that had their case studies or study areas as Gauteng Province.

This was done using mainly the desktop technique. This refers to the use of internet searches with the aim of collecting information. In this database, this technique was supplemented by visits to institution's libraries (e.g. Ekurhuleni Metropolitan Municipality) in the previous financial year to collect information from their intranet.

As part of the data collection process, the objectives and project descriptions were summarised after reading the research report to clearly depict what the study hoped to achieve.

b) Data Management

Data and relevant records, such as research papers and links to the research studies were captured and stored during the register compilation process and have been saved on the GDARDE shared folder to enable access to interested stakeholders. This process is repeated annually.

c) Data Quality

The Research and Development unit is responsible for updating and maintaining the database. Data collection procedures and quality control measures to ensure data accuracy and integrity are being considered in the updating of the ERR. The latest version of the ERR underwent internal and external reviewing for comments and suggestions for improvement.

Quality checking included verification of collected data and its relevance. The studies that didn't fit within the defined parameters and scope of the database were removed as well as duplications that results from ongoing capturing of studies. Quality check process is continuous and applied as new information is being captured in the database on regular basis.

d) Data sharing outside the GDARD

The first annual ERR and approved supporting documents (i.e. manual and annual reports) were shared with interested individuals, organisations or institutions outside of the GDARD through meetings and Fora. These raised awareness of the project and helped to promote collaboration and partnership with other research institutions and will reduce duplications in future. The approved annual reports are shared in various bilateral meetings and forums.

Furthermore, as mentioned above the Department through its MOA with the University of Johannesburg hosts the ERR on the UJ website (Click here) to get a wide cover of stakeholders and promote usage by students and other researchers.

4.2 THE APP

The APP was generated using a trial in error method. After a series of coding and vigorous process of working on the back end of various Deploying techniques the most user friendly one had to be used. The APP has been deployed and can be accessed (Click here) online and through devices such as cell phones and tablets, for installation (Click here)

Issues of data accuracy and security had to also be considered in ensuring that the intellectual property rights of the department were not compromised. As such the APP was generated and deployed for the purposes of viewing and accessing the data. The editing right of the APP still lies with the generator of the APP who in this case is the same person who is responsible for updating the ERR and is an employee of the directorate.

The development of the APP included development of prototypes to test the relationship between the back end language of input with the visual and interactiveness of the out put.

Just like any other APP the paid options have added benefits that otherwise the free versions would have limited to. As such it is recommended that the not only is the data display option improved but also paid services that the subscribtion offers be considered for better customisation and to create a wider audience reach.

4.3. FINDINGS

In this section, the various economic contributors are first highlighted on; this is then subsequently followed by the analysis of the ERR database.

4.2.1 Economic contributors

After rallying in the third quarter of 2022, South African gross domestic product (GDP) declined by 1,3% in the fourth quarter (October–December).Growth was dragged lower mainly by finance, trade, mining, agriculture, manufacturing and general government services.

Finance and trade the biggest drags on growth

Seven of the ten industries contracted in the fourth quarter. The finance, real estate & business services industry shrank by 2,3%. This was on the back of lower economic activity in financial intermediation, insurance & pension funding and auxiliary activities. As the finance, real estate & business services industry is the largest in the South African economy, the 2,3% decrease was the biggest factor behind the decline in GDP, subtracting 0,6 of a percentage point from GDP growth.

The trade, catering & accommodation industry was the second largest negative contributor to growth, recording a contraction of 2,1%. This was mainly due to a decline in wholesale trade. Mining output was dragged lower by a decline in the production of diamonds, iron ore and platinum group metals (PGMs). Economic activity in the electricity, gas & water supply industry was hampered by lower levels of production and consumption of electricity (mainly due to load shedding) and water.

Agriculture recorded the largest contraction in the quarter (-3,3%), pulled lower mainly by weaker production figures for field crops and horticulture products.

On the positive side, transport, storage & communication, construction and personal services were the bright spots in the fourth quarter. Transport, storage & communication made the largest positive impact, rising by 0,7% and contributing 0,1 of a percentage point to growth. This was mainly due to increased economic activity in passenger land transport, air transport and communication services.

Economic growth flat since 2019

The fourth quarter data concludes the results for the calendar year, providing an opportunity to revisit the annual GDP series. The South African economy grew for a second consecutive year, expanding by 2,0% between 2021 and 2022, from R4,50 trillion to R4,60 trillion.

Although GDP reached an all-time high in 2022, the economy has only grown by 0,3% from the 2019 pre-pandemic reading of R4,58 trillion. This lags behind the 3,5%[3] rise in the country's population over the same period (Figure 2).

Exploring the economy in more detail, six industries have yet to recover to their pre-pandemic levels of production (Figure 3). Construction is the worst in shape, remaining 23,1% smaller than what it was before the pandemic. In fact, construction's woes started way before COVID-19. A shadow of its former self, 2022 marked construction's sixth consecutive year of economic decline.

On the upside, South African agricultural activity was robust in the face of the pandemic. The industry grew strongly in 2020 while many other industries faltered, following up with further gains in 2021 and 2022. The finance, real estate & business services industry also recorded positive growth figures for all three years, although not as strong as agriculture.

For more information, download the latest GDP statistical release, media presentation and Excel files here.

The trade, catering and accommodation industry decreased by 5,5%, contributing -0,7 of a percentage point to GDP growth. Decreased economic activities were reported for wholesale,

retail and motor trade; and catering and accommodation services.

The manufacturing industry decreased by 4,2% in the third quarter, contributing -0,5 of a percentage point to GDP growth. Eight of the ten manufacturing divisions reported negative growth rates in the third quarter. The motor vehicles, parts and accessories and other transport equipment division made the largest contribution to the decrease in the third quarter. The food and beverages division and basic iron and steel, non-ferrous metal products, metal products and machinery division also made noteworthy contributions to the contraction.

The agriculture, forestry and fishing industry decreased by 13,6% and contributed -0,4 of a percentage point to GDP growth. The decrease was mainly due to decreased production of field crops and animal products.

The transport, storage and communication industry decreased by 2,2%, contributing -0,2 of a percentage point. Decreased economic activity was reported for land transport and air transport.

Unadjusted real GDP at market prices for the first nine months of 2021 increased by 5,8% compared with the first nine months of 2020.

4.2.2 Database analysis

The results presented below are from 421 studies that have been captured in the ERR. There's 100 more studies than the previous financial year. After peer review there were 321 studies captured. Adjustments to the register were continuously made to ensure the register is not only user-friendly and comprehensive, but meets the needs of the institutions that were consulted during the developmental and updating phases.

a) Number of studies per economic sector

The table and graph below represents the number of studies captured in the database. The findings are similar to those of the previous financial year; however, the figures have changed due to more studies being added to the database.

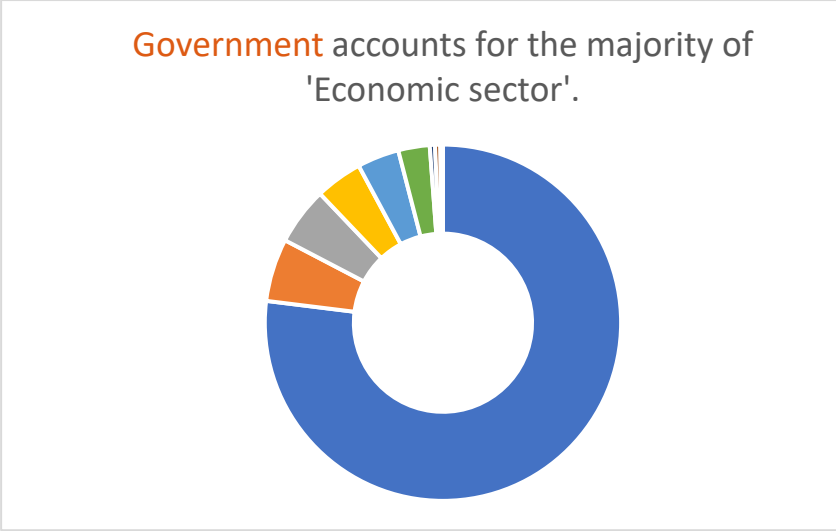
It is still found that the government has the highest number of studies captured in the ERR (324 of the 421 studies) due to most selected services (e.g. Air Quality, Disaster management, Health, Waste and Water) being the function of the government sector. This could also be explained by the fact that government services are amongst the top 3 GDP contributors of the country as indicated above. The mining sector is second (24 of the 421 studies) due to mining being one of the drivers to economic development in Gauteng province.

Agriculture is third (22 of the 354 studies) due to importance of food security in Gauteng which is the most populous province in South Africa. Communication is still the least (no studies) ascended by trade, finance and personal services.

The low number of studies for these sectors is expected as environmental research has little relevance for them. Internationally the Trade and Finance sectors are becoming more cognisant of the environmental challenges and further sources of information and the trade and financial websites will be examined using different range of keywords to find out if there is more research is done for Gauteng province.

Row Labels	Count of Economic sector
Government	324
Mining	24
Agriculture	22
Construction	18
Electricity	16
Transport	12
Personal services	2
Manufacturing	2
Trade	1
Grand Total	**421**

Table 1: No of studies per economic sector.



Graph 2: Number of studies per economic sector

b) Focus areas

The below graph illustrates the focus areas of the studies that are currently captured on the ERR. The below categories are environmental categories used in the ERR.

Given that South Africa is a water scarce country it is not suprising that most of the studies (64 out of the 421 studies) focused on water.

Examples of studies that justify the water scarcity include the following:

- Drought response strategy in Gauteng.
- The application of water poverty mapping in water management.
- Towards a water sensitive city. The case of Johannesburg.
- Exploring the potential greywater use in a typical microcosmic commercial area of South Africa.

The sector that ranked the second highest in the ERR being waste with (65 of the 421 studies), this could also be as a result of having more intintiatives that focus in waste e.g of waste programmes presented in the ERR are :

The need to shift from waste to energy:

- Comparative Analysis of the Waste-to-Energy (WtE) Technologies using Municipal Solid Waste (MSW);
- Municipal solid waste management in South Africa: From waste to energy recovery through waste-to-energy technologies in Johannesburg;

, this is also justified by the reasons touched on in the above sections regarding contribution of economic contributors as retail was improving even though other sectors were declining.

The economic position of the country also resulted in adaptive measure to economic crisis hence , it is not surprising that the third highest studies conducted studies focuses on energy as most researchers are looking at ways to help “energy poor” population to find alternative or more affordable sources of energy.

Examples of studies that seek alternative energy include:

- Forecasting photovoltaic electricity generation at a private dwelling in Tshwane, South Africa: A case study
- The potential and reality of the solar water heater programme in South African townships: Lessons from the City of Tshwane,
- Energy efficiency practices in facilities management in Johannesburg,
- Municipal solid waste management in South Africa: from waste to energy recovery through waste-to-energy technologies in Johannesburg.

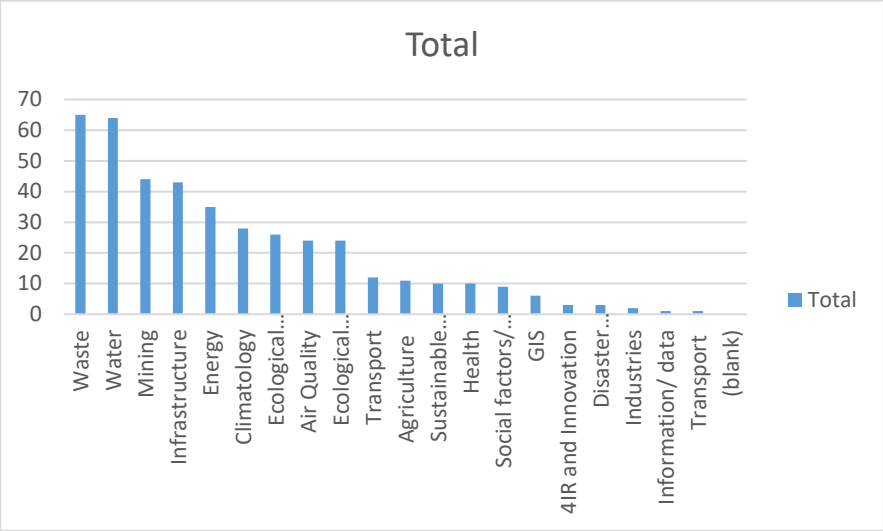
Water and waste studies have surpass mining studies which has been the focus area of interest in Gauteng province for the past decades.

Unlike the two previous reports, the water sector has the highest number of studies (64 of the 421 studies) present in the ERR. This could be justified by the fact that water scarcity is still the major issue for Gauteng.

For now, Geographic Information System (GIS) has only six study because it was added at the later stage of data collection. Fourth Industrial Revolution (4IR) and Innovation have been combined together as they produce similar outcomes. It is also important to note that the industrial research looks also very limited, but it is possible that this type of research is proprietary and could not be accessed through internet searches.

Row Labels	Count of Field of study/ benefictor
Waste	65
Water	64
Mining	44
Infrastructure	43
Energy	35
Climatology	28
Ecological research: Biodiversity	26
Air Quality	24
Ecological research: Ecosystems	24
Transport	12
Agriculture	11
Sustainable development	10
Health	10
Social factors/ socio economic	9
GIS	6
4IR and Innovation	3
Disaster management	3
Industries	2
Information/ data	1
Transport	1
(blank)	
Grand Total	**421**

Table 2: No. of studies per field of studies



Graph 3: Focus areas

c) Area of implementation

The studies captured were individually categorised to areas of implementation that they fall under. This is also related to the purpose of the study. For instance, some studies were providing information, while others suggested ways of managing the resources, addressing issues of pollution, had suggestions on how to deal with climate change issues,

proposed green infrastructure initiatives, etc. It is important to note that some studies fell under more than one category, however they had one dominant area, so the dominant one was used.

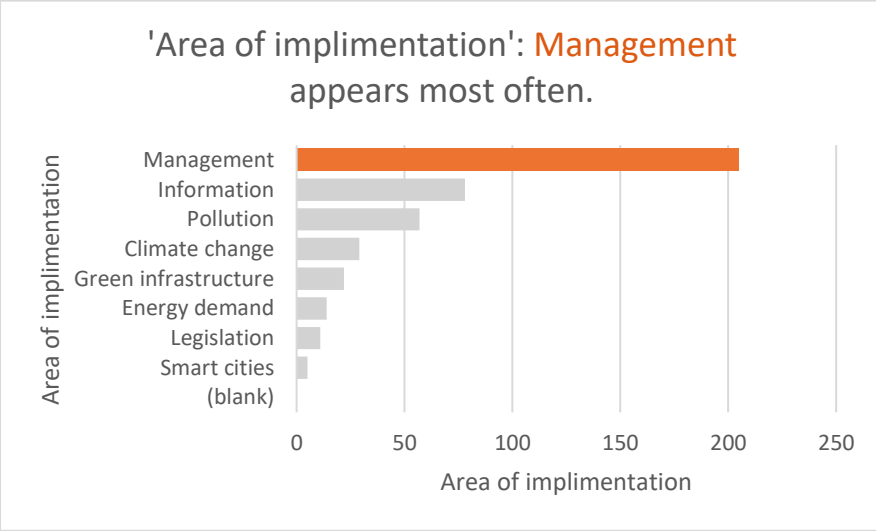
The graph 4 below shows that there's a shift to management of resources from just provision and demands.

This graph differs from the others in a sense that the size of the block depicts the contribution.

It must be noted that this classification is still quite vague and will be improved based on inputs from users of the ERR.

Row Labels	Count of Area of implementation
Management	205
Information	78
Pollution	57
Climate change	29
Green infrastructure	22
Energy demand	14
Legislation	11
Smart cities	5
(blank)	
Grand Total	**421**

Table 3: No. of studies per area of implementation



Graph 4: Areas of implementation

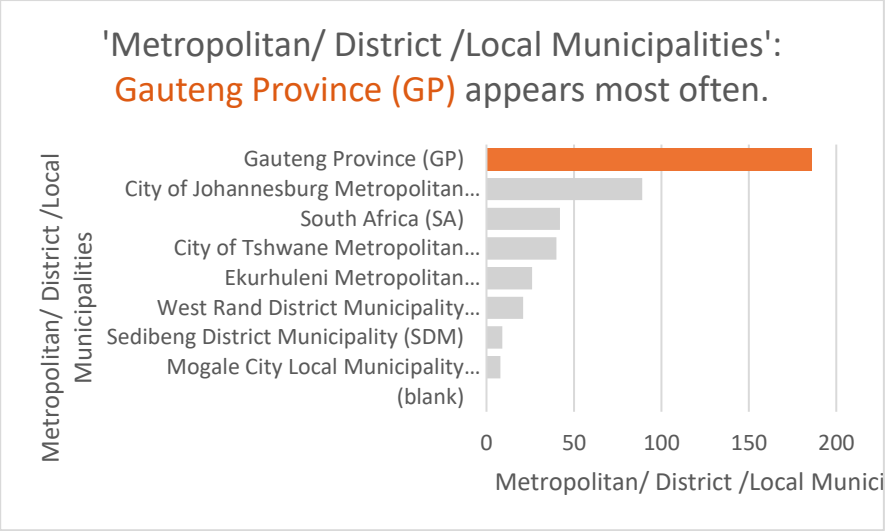
e) Geographic location

The below table and graph shows the distribution of studies per municipality. The province was used as a study area in cases where the study included more than one municipality. South Africa was also used as a geographic area for studies that researched a number of provinces, while Gauteng was one of the case studies.

Since the ERR objective was to reflect provincial status, the results showed that Gauteng province has the highest number of studies captured (186 of the 421 -42%), followed by the city of Johannesburg with 89 of the 421 studies. Smaller municipalities such as Mogale City account for only 2%.Important to note in this aspect is that some institutions outside of Gauteng Province had their case studies in Gauteng (see graph below).

Row Labels	Count of Metropolitan/ District /Local Municipalities
Gauteng Province (GP)	186
City of Johannesburg Metropolitan Municipality (COJ)	89
South Africa (SA)	42
City of Tshwane Metropolitan Municipality (COT)	40
Ekurhuleni Metropolitan Municipality (EMM)	26
West Rand District Municipality (WRDM)	21
Sedibeng District Municipality (SDM)	9
Mogale City Local Municipality (MCLM)	8
(blank)	
Grand Total	**421**

Table 4: No. of studies per municipality

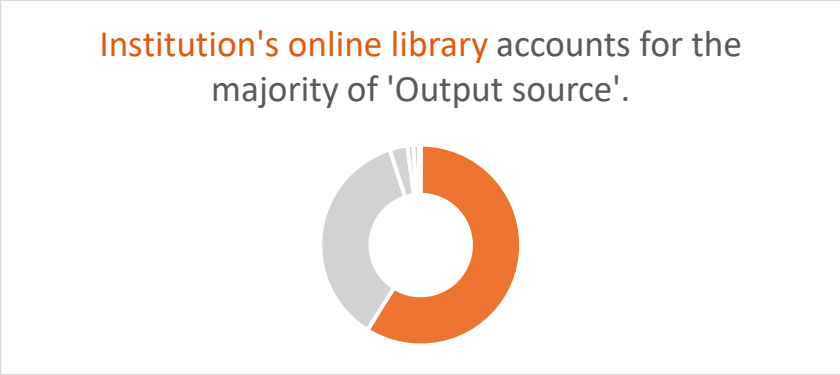


Graph 6: Geographic locations of case studies

f) The output sources

The graph below shows the sources of dissemination of research output or studies. As indicated above, most institutions use their online library. Some researchers disseminate their information through more conventional sources such as journals or presentation at conferences.

Row Labels	Count of Output source
Institution's online library	248
Journal	152
Seminar/ Conference	12
Government publications	4
Other website/ online source	4
Chapter	1
(blank)	
Grand Total	**421**



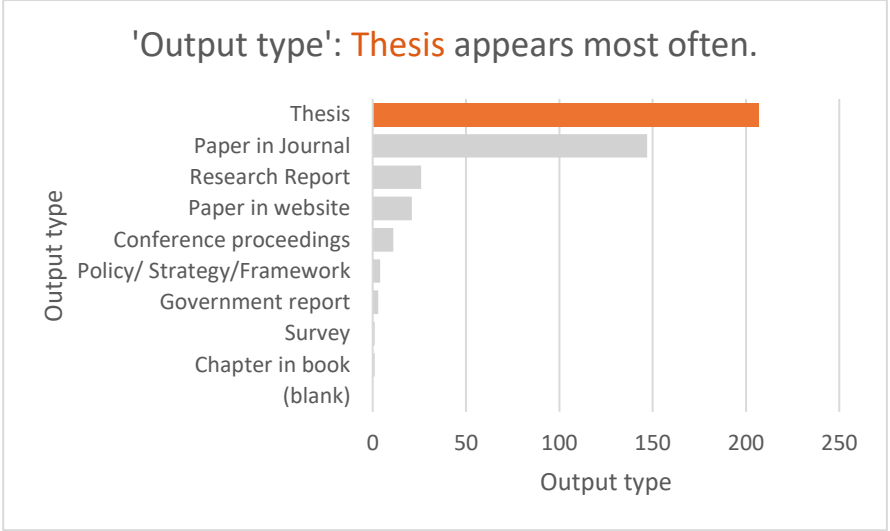
Graph 7: Output sources

g) Output type

From the table and graph below, it can be deduced that most of the studies captured on the ERR are produced by universities in form of thesis (207 of 421 studies). The least number of studies captured is government report and surveys (see more detailed discussion in the section on Host institutions).

Table 7: No of studies per output type

Row Labels	Count of Output type
Thesis	207
Paper in Journal	147
Research Report	26
Paper in website	21
Conference proceedings	11
Policy/ Strategy/Framework	4
Government report	3
Survey	1
Chapter in book	1
(blank)	
Grand Total	**421**

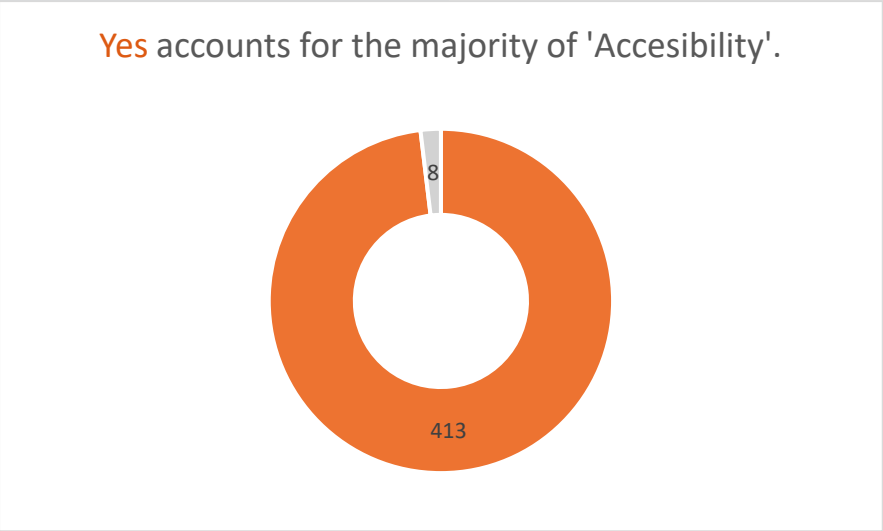


Graph9: No of studies per output type

h) Status

The below graph indicates that of the studies presented in the ERR only 8 studies that could not be accessed easily.

Row Labels	Count of Accesibility
Yes	413
No	8
(blank)	
Grand Total	**421**



Graph 9: Status

5. LINKAGES TO THE ANNUAL GAUTENG RESEARCH SYMPOSIUM

The ERR can be further mined for data in future to check for research gaps as well as focus areas of the studies that are carried out to channel the drafting of the concept note for next research symposium, choosing of themes as well other supporting documents. The ERR is already having enough studies to show areas in which researchers are interested in discussing as well as addressing the emerging areas where more research can be added. The ERR enables the user to see in a glimpse the saturated areas as well as areas in which research is still not sufficient.

The above analysis of the ERR supports identified research gaps from the last (2021) Research symposium, such as the need to ensure governance of environmental activities, management of waste, as well as ecosystem services amongst others.

6. WAY FORWARD/ RECOMMENDATION

The following are few items that can improve the quality of the report in future:

- Further exploration of the transitioning of the ERR from desktop to the APP.
- Updating and hosting of the ERR on the UJ ACE's website.
- Bilateral meetings will continue being organised with institutions that could open up their access to intranet to allow for easy access to work done and avoid duplication of work and create a conducive environment for forging partnerships and collaborations.
- Consultative workshops should be held with producers of the reports to explain the uses and benefits of sharing their work, hence improve the bringing forward of work to be captured and shared with a wider audience.
- The gaps identified will be presented to academia and research institutions that have potential to conduct research in such areas.
- The trade and financial websites will be examined using different range of keywords to find out if there is more research done on financial aspects of environmental challenges.
- More information on projects conducted within the EPPC directorate will be added in future, such include the research to be conducted as part of the Sustainable Public Procurement Guidelines (SPPG) project.

The register and approved reports will be shared with stakeholders outside the departments using various fora. This will promote collaboration and partnership with research institutions, evidence-based selection of new research and more effective implementation of research outcomes.

7. REFERENCES:

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