



The human dimension of plastic pollution in South Africa

Building capacity to
understand behavioural
drivers

SANO Young Researchers Competition 2022

Project report prepared by Isabel Richter, Claudine Roos, Nicolas Neef, Kapandu Shihepo & Tonje Nerkvern

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1. Introduction

Since the introduction of plastic in industry and private households during the 1950's its image has changed significantly from a jack-of-all-trades to a problem child. The boom of short-lived plastic products (single-use) in combination with inadequate end-of-life treating and low recycling rates, leads to the material spilling into the environment in enormous quantities. Today, the usefulness of plastic bags, packaging, and other products, is outweighed by the damage it does to nature, people's health and wellbeing and the economy. To counteract the negative consequences of plastic pollution, a wide range of policies, such as levies and incentives, and technical solutions, such as biodegradable plastics, have been developed. Nevertheless, none of these attempts has shown large-scale and long-term success and plastic pollution keeps rising. Often, solutions are only short-lived, poorly implemented or fail because of human factors: it is underestimated how people interact with new technologies, how they use biodegradables or if an intervention might cause rebound effects.

With plastic pollution being a purely anthropogenic problem, we therefore suggested focusing our attention on human perceptions and behaviour. Only if we understand how people perceive the problem and why they behave the way they do, appropriate interventions can be developed. We brought together interdisciplinary expertise (see section on "Team" below) from South Africa and Norway to jointly address plastic pollution in South Africa, with a focus on plastic bags.

In this project, generously funded with NOK 500.000 by Handelens Miljøfond (<https://handelensmiljofond.no/>) we focused on plastic bag consumption due to its relevance and popularity in the South African context. We assessed the psychological and situational drivers and barriers that determine the acquisition of plastic bags in the supermarket, their usage, and different options of disposal.

In specific, we will look at:

- 1) the behavioural patterns leading to plastic bags being consumed in such a high rate,
- 2) core behavioural drivers for plastic bag consumption and how these relate to self-reported behaviour and intentions,
- 3) the value of potential future visions that identify levers to reduce the amount of plastic bags consumed.

By using a multi-methods approach, we drew a comprehensive picture of plastic bag consumption in South Africa. Subsequently we developed suggestions of how to change the process to result in less plastic bags used and ultimately end up in the natural environment.

2. Project team

The team consisted of team members from Norway and South Africa and include two researchers from each country and one research assistant from each country.



Project lead: Isabel Richter

Associate Professor

Norwegian University of Science and Technology,
Norway



Researcher: Nicolas Neef

Researcher

University of Hohenheim, Germany

Research assistant: Tonje Nerikvern, Master's degree student, Norwegian University of Science and Technology.



Researcher: Claudine Roos

Associate Professor

North-West University, Potchefstroom Campus, South
Africa



Researcher: Kapandu Shihepo

Researcher and Master's degree student

North-West University, Potchefstroom Campus, South Africa

Research assistant: Carrigan Harper, PhD student, North-West University, Potchefstroom Campus, South Africa.

3. Project scope

For our study, the town of Potchefstroom, located in the JB Marks Local Municipality, North-West Province of South Africa was the primary research location.

The study uses a mixed methods approach, including status review, surveys, Observations and stakeholder consultations.

Surveys and observations were conducted in two grocery stores - Checkers (Store A) at the Mooi River Mall and Shoprite (Store B) at the Riverwalk Mall. Both stores belong to the same chain and are situated across the road from one another at two different shopping centres. Shoprite is regarded as the “cheaper” of the two stores, as it offers goods in bulk or at discount. The demographic profile of the customers of the stores may differ, but not significantly in terms of race and income-profile of customers. Surveys and observations were conducted 23 - 28 November 2022 (Wed, Thurs, Fri, Sat, Mon) at Checkers, and 29 November - 3 December 2022 at Shoprite (Tues, Wed, Thurs, Fri, Sat).

We applied a mixed methods approach consisting of a status review, surveys, stakeholder consultations and observations. The status review comprised key literature, policy reports and first-hand experiences from selected stakeholders in South Africa (e.g. waste management sector, retail, education, politics and tourism).

For the survey, established scales were selected, based on recent literature, adapted to the context, and critically reviewed by local stakeholders. The survey questions were piloted with a small subsample of respondents in order to obtain a measuring instrument tailored to the specific target.

4. Research Objectives & Timeline

The research objectives included:

- Determining the behavioural patterns leading to plastic bags being consumed in such a high rate,
- Evaluating the core behavioural drivers for plastic bag consumption and how these relate to self-reported behaviour and intentions,
- Exploring future visions that identify levers to reduce the amount of plastic bags consumed, and
- Suggesting interventions towards reducing the amount of plastic bags consumed in future.

The project phases and timeline are outlined in Table 1.

Table 1. Project phases and timeline of plastic bag project

TASK		OUTPUT	START	END
Phase 1 PROJECT INTITATION AND PLANNING				
1.1	Project planning meeting1	Notes of meeting	14-Jul-22	14-Jul-22
1.2	Drafting of proposed budget allocation, proposed project plan and draft Gantt chart	Draft budget allocation and Gantt chart with preliminary project plan	23-Aug-22	24-Aug-22
1.3	Project planning meeting 2: 24 August 2022	Notes/minutes of meeting	24-Aug-22	24-Aug-22
1.4	Project planning meeting 3: 2 September 2022	Notes/minutes of meeting	2-Sep-22	2-Sep-22
1.5	Finalization of project management plan and inception report, budget and Gantt chart Drafting of MoU (required from as part of NWU financial requirements)	- Inception report with project plan/Gantt chart - Finalized MoU ready for signature	24-Aug-22	30-Sep-22
Phase 2 DRAFT BACKGROUND DOCUMENT (Webpage and video)				
2.1	Drafting of background document (webpage)	Draft background document	1-Sep-22	8-Sep-22
2.2	Design of conceptual video	Conceptual video	8-Sep-22	23-Sep-22
2.3	Review background document and video		23-Sep-22	30-Sep-22
2.4	Finalize background document and video	Final descriptive background document and video	30-Sep-22	2-Oct-22
Phase 3 SURVEY QUESTIONNAIRE FINALIZATION AND STAKEHOLDER DIALOGUE				
3.1	Drafting and finalization of survey questionnaire	Survey questionnaire	1-Sep-22	15-Sep-22
3.2	Identification of stakeholders for stakeholder engagement process	Proposed list of stakeholders to be approved by project team	22-Aug-22	24-Aug-22
3.3	Approval of stakeholders by project team	Approved list of stakeholders	24-Aug-22	2-Sep-22
3.4	Invitation of stakeholders to stakeholder participation workshop (Invitation plus background document on stakeholder workshop expectations)	Sent stakeholder invitations, with background information document	2-Sep-22	2-Oct-22
3.5	Plan stakeholder workshop	Outline presentation with stakeholder participation workshop content and project plan	2-Oct-22	11-Oct-22
3.6	Facilitate and attend stakeholder workshop Preparation meeting: 11 October @ 14h00, Stakeholder meeting: 13 October 10h00 - 12h00 (virtual) Aim of stakeholder engagement: Finalization of survey questionnaire, alternative shopping (without plastic carrier bags) scenario	Attendance register and minutes/notes of stakeholder workshop	11-Oct-22	13-Oct-22

TASK		OUTPUT	START	END
3.7	Write up the outcomes of the stakeholder workshop	Final stakeholder workshop report	30-Oct-22	30-Oct-22
3.8	Amend project plan and survey questionnaire according to stakeholder inputs	Finalized project plan and finalized questionnaire	5-Nov-22	12-Nov-22
Phase 4 DATA ACQUISITION				
4.1	Develop a draft sampling plan and strategy for comment by project team	Draft sampling plan/strategy	20-Jul-22	30-Oct-22
4.2	Determine availability of NWU students for data collection in November/December 2022 and facilitate NWU process for appointing students	List of students and completed NWU HR forms	30-Sep-22	15-Nov-22
4.3	Appoint a student coordinator (proposal: Carrigan Harper) to manage/facilitate data collection process	Completed NWU HR forms	15-Sep-22	15-Sep-22
4.4	Draft a data collection plan and present to project team (Suggested grocery stores, number of surveys per day, etc.)	Draft collection plan	15-Sep-22	30-Oct-22
4.5	Project progress meeting3: Proposed date 11 October 2022 (combine with preparation meeting) and 19 October 2022	Minutes of meeting		
4.6	Finalize data collection plan and contact stores to obtain consent to collect data	Final data collection plan with confirmed consent from grocery store managers/owners	21-Oct-22	11-Nov-22
4.7	Make logistical arrangements for data collection (transportation, student coordination, etc., Kapandu travel and accommodation) and data collection workshop	Finalized logistical and administrative arrangements	15-Oct-22	30-Oct-22
4.8	Project progress meeting 4: 10 November 2022 (plan data collection workshop, data collection etc.)	Minutes of meeting	10-Nov-22	10-Nov-22
4.9	Prepare for data collection workshop		17-Nov-22	20-Nov-22
4.10	Present data collection workshop: Proposed dates 21 and 22 November 2022	Data collection workshop (attendance register, Powerpoint slides)	21-Nov-22	22-Nov-22
4.11	Data collection: 23 November - 3 December 2022 (KS to attend two days to facilitate data collection)	Completed survey sheets and captured data (electronic)	23-Nov-22	3-Dec-22
4.12	Consolidate survey and observation data	Excel sheets sent to NTNU	5-Dec-22	5-Dec-22
4.13	Prepare and submit ethics application for Master thesis data collection for Norwegian sample	Ethics approval	Sept 2023	
4.14	Collect data for master thesis looking at Norwegian-South African differences and habits	Thesis and scientific article	Nov 2023	
Phase 5 DATA CAPTURING AND DATA ANALYSIS				
5.1	Appoint a NTNU data capturer	Appointed data capturer (Tonje Nerikvern)	1-Nov-22	1-Nov-22

TASK		OUTPUT	START	END
5.2	Data analysis	Data analysis	6-Dec-22	13-Jan-22
5.3	Project progress meeting 5: Proposed date 18/19 January 2023	Minutes of meeting	19-Jan-23	19-Jan-23
5.4	Drafting of project report (Results)	Draft report with survey results	17-Jan-23	16-Feb-23
5.5	Project progress meeting 6: Proposed date 16 February 2023 (Planning of visit to RSA)		16-Feb-23	16-Feb-23
INTERVENTION TOOLBOX (Suggestion of interventions)				
6.1	Prepare for intervention development workshop	Planning document	16-Feb-23	23-Feb-23
6.2	Logistical arrangements for intervention workshop	Travel, accommodation, venue, etc.	1-Jan-23	25-Feb-23
6.3	Facilitate and attend intervention workshop in Potchefstroom, South Africa (Dates: 27 Feb - 3 March 2023)		27-Feb-23	3-Mar-23
6.4	Draft final project report with suggested interventions (update "shopping video")	Final project report	3-Mar-23	18-May-23
6.5	Project close-out meeting	Minutes of meeting	19-May-23	19-May-23
6.6	Finalize and send project close-out report	Close-out report	19-May-23	31-May-23

5. Research activities

Activities included in the project are outlined in Table 1 and discussed in more detail below.

5.1. Stakeholder workshop

A stakeholder workshop was held on 13 October 2022 via MS Teams. The specific objectives of the workshop were to:

- Critically analyse the current plastic bag consumption process; and
- Collectively create ideas and visions of how this process can be adapted in order to reduce plastic bag use and spill into the environment.

Stakeholders attending the workshop consisted of the project team, government, academia/researchers, and an NGO.

Project team:

- Isabel Richter: NTNU, Project Leader
- Nicolas Neef: University of Hohenheim, Project team member
- Kapandu Shihepo: North-West University, Project team member
- Claudine Roos: North-West University, Project team member
- Tonje Nerkvern: Student research assistant
- Oliver Riordan: Student research assistant
- Kaya Ott: Student research assistant

Government:

- Mulalo Tshikotshi: DFFE, Control Environmental Officer
- Pamela Nxumalo: DFFE
- Masilo Donald Sehaswana: DFFE, Waste Policy and Information Management

Academia/researchers:

- Thea Schoeman: University of Johannesburg, Senior Lecturer
- Rinie Schenck: University of the Western Cape
- Kyle van Heyde: University of Johannesburg, PhD student
- Valentina Russo: CSIR, Senior Engineer
- Linda Godfrey: CSIR, Manager Waste RDI Roadmap
- Anton Nahman: CSIR, Research Group Leader: Sustainability, Economics and Waste
- Suzan Oelofse: CSIR, Principal Researcher: Sustainability, Economics and Waste

NGOs/industry:

- Presha Soogrim: SAAMBR, Designation: Manager- Informal Education

An outline of the stakeholder presentation that guided the workshop is given below:



Figure 1. Outline of the presentation used to guide the stakeholder workshop.

5.2. Shopping scenario and plastic bags videos

In an attempt to develop interventions towards reducing the use of plastic carrier bags, a video was developed to present the typical shopping scenario as observed in South Africa. The video (Video 1) represents the current ‘undesirable’ scenario, where plastic shopping bags are used (sometimes being double-bagged and unnecessary separation of items into different bags). In this scenario, the bags are thrown into the waste bin after use, without any attempts to re-use the bag. The video link is available at: <https://osf.io/kug2d>.



Figure 2. Screenshot of Video 1 (typical shopping scenario) where Thandi uses multiple plastic shopping bags.

This video was used during the stakeholder workshop (see 5.1 above) to elicit discussions to create a narrative towards a more ideal shopping situation. The narrative suggested by stakeholders were used to inform a more 'ideal/desirable' shopping scenario which aims to prevent/reduce the use of plastic shopping bags.

Video 2 focuses on plastic carrier bag usage and behaviour in an 'ideal/desirable' shopping scenario in South Africa (following inputs from the stakeholder workshop). A link to the video is available here: <https://osf.io/g4fe5>.



Figure 3. Screenshots of Video 2 ('ideal/desirable' shopping scenario).

The video was developed as an intervention towards changing human behaviour towards reducing plastic carrier bags.

A survey regarding plastic carrier bag usage and perceptions (feelings/emotions) were developed (See Section 5.5) where both videos were included.

The survey also included a section on respondents' opinions of where/how the video may be used to raise awareness on plastic carrier bag usage.

5.3. Training and capacity building

Training took place prior to data collection (surveys and observations). The training was presented by Ms. Kapandu Shihepo (NWU Masters student, Researcher at Gobabeb Research Institute, Namibia) on 21 and 22 November 2022 at the North-West University in Potchefstroom

The focus of the training included:

- Background on the project;
- Plastic carrier bag usage in Africa/South Africa;
- Problems with plastic carrier bags (pollution);
- Background on the human dimension of plastic carrier bag usage;
- Survey and observation training (methods and techniques);
- Roleplay and practice (surveys and observations)

Total persons trained:

- 6 x Honours degree students (responsible for data collection);
- 1 x PhD student (responsible for overseeing data collection).



Figure 4. Training taking place prior to data collection.

5.4. Data collection

Data collection through surveys and observations took place between 23 November and 3 December 2022 (with no data collection on Sunday, 27 Nov).

The study area selected to explore the research aim is the town of Potchefstroom in the North-West Province, South Africa.

As explained in Section 1, two grocery stores located in Potchefstroom (referred to as “Store A” and “Store B” for the purposes of this research) were selected for this research. Both stores belong to the same supermarket chain, but are located in two different shopping malls, within the same geographical area. Two different stores, with potentially different shopper/customer profiles, were included in the sample to aim towards reaching a diverse/representative sample of respondents (i.e. low-income and middle-class).

Although data was collected from a single study area (Potchefstroom), we believe that the results on plastic bag behaviour may have broader application for the South African and developing country contexts in general.

Plastic bags and alternatives offered by grocery stores:

The cost of 24-micron single-use plastic bags at both stores was the same (R1.00 or 0.05 USD), and both stores offered paper bags and 70-micron high density polyethylene (HDPE) bags as alternatives. Store A charged R2.50 (0.14 USD) and Store B charged R2.00 (0.11 USD) for paper bags. The price of re-usable HDPE bags was R3.00 (0.16 USD) at both stores, and the supermarket chain offers an incentive of R0.50 (0.03 USD) off a customer’s next purchase if the HDPE bag is re-used. Store A also offered two other options (which was not offered at Store B): recycled polyethylene terephthalate (rPET) bags at R6.50 (0.36 USD) and heavy duty woven polypropylene bags at R24.99 (1.37 USD).

The number of survey respondents and number of observations performed are provided below.

Survey questionnaires completed:

Total surveys: n = 571

- 288 surveys completed at Checkers;
- 283 surveys completed at Shoprite.

Observations:

Total observations: n = 327

- 139 observations completed at Checkers;
- 188 observations completed at Shoprite.

Each of the observations were done individually by two separate observers. The pair used the same naming/identifier for their observed customer.



Figure 5. Data collection at Store A (Checkers) at the Mooi River Mall, Potchefstroom, South Africa.



Figure 6. Data collection at Store B (Shoprite) at the River Walk mall, Potchefstroom, South Africa.

5.5. Developing a survey to study communication effectiveness of future scenarios (building on video 1 and 2)

The project team developed a voluntary survey on plastic carrier bag pollution. The aim of the survey was to gather responses on perceptions/feelings/emotions related to plastic bag usage illustrated in the two shopping scenarios provided in the survey. The research aim was to determine, if future scenarios of a plastic free shopping process distributed via video can help foster environmental behaviour.

Findings and respective suggestions for change will be communicated to relevant local stakeholders and the scientific community. It is envisioned that the data will underpin future policies and management strategies regarding plastics in South Africa.

The survey is expected to take approximately 5 to 10 minutes to complete. Participation in the survey is voluntary and completely anonymous.

The survey was distributed via email and a panel provider to participants. A total of 382 completed the survey. This data set will inform paper 3 (see Section 6.3 below).

5.6. Intervention workshop and compiling the final report, networking and paper writing

During the week of 27 February to 3 March 2023, a final workshop was scheduled, where all of the research team members gathered in Potchefstroom. The participants included: Isabel Richter, Nicolas Neef, Tonje Nerkvern, Claudine Roos, Carrigan Harper. Kapandu Shihepo was unable to join the workshop due to other work/research commitments. Workshop activities are outlined in Table 2.

Table 2. Activities during workshop held in Potchefstroom from 27 February to 3 March 2023

DATE	ACTIVITIES
27 February 2023	<ul style="list-style-type: none"> Setting the agenda for the week. Drafting the SANO project feedback report.
28 February 2023	<ul style="list-style-type: none"> Review and finalization of Paper 1: <i>Creating a shared vision by uniting local stakeholders to tackle plastic bag consumption.</i> Data analysis, writing up of survey and observation findings. Working on Paper 2: <i>Why do consumers bring their own bag to the shop? A multi-methods approach.</i> Distribution of video survey questionnaire to potential participants.
1 March 2023	<ul style="list-style-type: none"> Submission of Paper 1 to: <i>Frontiers in Communication (Science and Environmental Communication)</i> Continue work on paper 2.
2 March 2023	Guest lecture & networking activities with NWU staff.
3 March 2023	<ul style="list-style-type: none"> Finalization of paper- and report writing. Setting the agenda for the way forward.

Guest lecture:

A guest lecture was presented by Isabel Richter, Nicolas Neef and Tonje Nerkvern on Thursday, 2 March 2023 at North-West University, Potchefstroom.

The purpose of the guest lecture was to share the findings of the SANO project on the human dimension of plastic pollution in South Africa, with the 'environmental management' academic community at the North-West University. Potential interventions were discussed among the attendees during the guest lecture.

The attendees included:

- 11 x academic staff members from the NWU; and
- 2 x Masters students, 1 x PhD student and 2 x post-doctoral students.

Contact details were exchanged at the end of the guest lecture to facilitate further communication and networking.

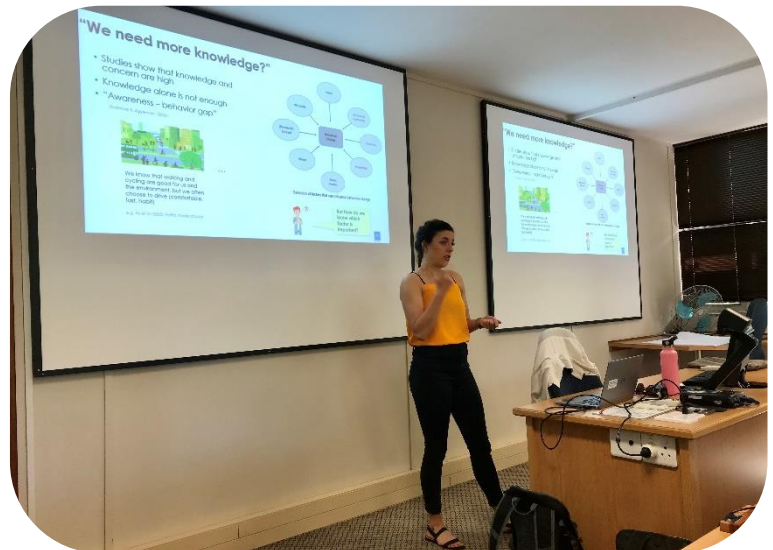
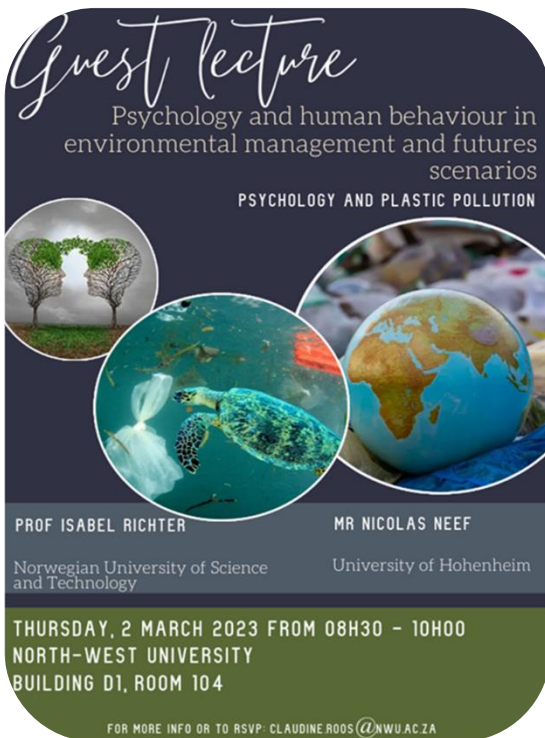


Figure 7. Invitation to guest lecture (left) and Prof. Isabel Richter presenting during the guest lecture (right).

6. Project outputs

The outputs coming from this project are manifold and consist of datasets, scientific articles, videos, professional capacity and networks for future research cooperations. The outputs are outlined in the sub-sections below.

6.1. Datasets

- **Dataset 1:** Survey (n = 571), behavioural drivers of plastic bag consumption (habits, social norms, convenience, barriers, self reported behaviours, intentions).
- **Dataset 2:** Observations (n = 327), observed behaviour or cashier, customer, and packer as well as outcome (number of plastic bags used).
- **Dataset 3:** Survey assessment of videos (n = 7) (which included experts and general population), perceived impact of videos, emotional impact, intentions.
- **Dataset 4:** Online survey (n = 342), intentions to reduce plastic consumption, positive/negative emotions, ascription of responsibility, perceived behaviour control

6.2. Research Dissemination

- Video depicting current process of plastic bag consumption (Video 1; available at <https://osf.io/kug2d>);
- Video depicting (more ideal) future vision of plastic bag consumption based on stakeholder consultation (Video 2; available at <https://osf.io/g4fe5>);
- Intervention suggestion: Dissemination of more ideal future vision of plastic bag consumption (Video 2) on social media platforms; and
- Guest lecture presentation (see 5.6) on SANO project findings.

6.3. Scientific Papers and Theses

The following publications are planned, based on the activities performed as part of the project:

- **Paper 1:** Creating a shared vision by uniting local stakeholders to tackle plastic bag consumption. **Published on 12 May 2023.** Citation: Neef NE, Shihepo K, Roos C and Richter I (2023) Creating a shared vision by uniting local stakeholders to tackle plastic bag consumption. *Frontiers in Communication*, 8:1177334. DOI: 10.3389/fcomm.2023.1177334
- **Paper 2:** Why do consumers bring their own bag to the shop? A multi-methods approach (Target journal: *Journal of Environmental Psychology*). This paper focuses on the findings of the plastic carrier bag survey and observations.
- **Paper 3:** Using Narrative Future Vision Communication as a Tool for Sustainable Behaviour Change in the Case of Single-Use Plastic Bag Consumption (Target Journal: *Environment, Development and Sustainability*). Focus on perceptions/emotions/feelings after watching video 1 and video 2.

The data collected and lessons learned during the project will also inform two Master's theses.

- Master thesis of Tonje Nerikvern, affiliated to NTNU: **Unravelling Habits, Intentions, and Behaviour: A Cross-Cultural Examination of Plastic Bag Consumers in Norway and South Africa.** The thesis will concentrate on the consumption of plastic bags in a

South African and Norwegian context. By studying the psychological factors that influence plastic bag consumption, we can gain insight and understanding of how individuals perceive the problem and why they engage in certain behaviours. The study will focus on the role of habits when it comes to individuals' consumption of plastic bags, the intentions associated with change in how habits affect the consumption of plastic bags, as well as individuals' self-reported behaviour. In the context of single-use plastic consumption, habits have been shown to be a factor that largely influences consumption, but there is still a need for knowledge about and how habits affect this behaviour, and how these behavioural patterns can vary in different groups and countries. The study will be using existing survey data from the SANO project and collect an equally large sample from Norway to establish knowledge on inter-country differences and similarities.

- Master thesis of Kapandu Shihepo, affiliated to NWU: **Evaluating consumer behaviour related to plastic carrier bags: A Namibian case study.** Namibia introduced a plastic carrier bag levy to reduce plastic bag consumption. There is limited research on the effectiveness, progress and the implications of plastic carrier bag levies on consumer behaviour. This research aims to understand consumer behaviour related to the use of plastic carrier bags, to ultimately understand whether the implementation of the plastic bag levy has influenced behaviour. Detailed objectives of research aim include; (a) assessment of consumers' awareness and perceptions about the plastic bag levy; (b) understand and analyse the factors that influence consumers' behaviour (decisions or choices) when opting to pay for plastic carrier bags; and (c) determine the impact of the plastic bag levy by quantifying and comparing consumer behaviour and use of plastic carrier bags before and after the enactment of plastic levy. The study is conducted at three central coastal towns of Namibia; Walvis Bay (harbour town), Swakopmund, and Henties Bay. These towns were the first to implement the voluntarily plastic bag charges before the plastic bag levy (Leuschner, 2019). The research is conducted by using survey questionnaires, semi-structured interviews, and local plastic bag data from retail stores. No minors or incapacitated adults are involved in the interviews, and no sensitive information is collected.

6.4. Professional capacity

Six students from the North-West University, Potchefstroom (South Africa) was trained prior to data collection taking place.

The training did not only focus on the subject-matter related to the project, but also focused more broadly on skills necessary for survey administration, engaging potential respondents and performing observations. These skills can be applied in further research/projects in future.

7. Summary of main findings

7.1. Study 1 (paper 1; data sets 1&2)

A summary of the main findings of the data collection phase (surveys and observations) are provided in Tables 3 - 5 and are briefly summarised below:

Table 3. Mean and Standard Deviation for all variables included in the model (predictors and dependent variable)

Variable	<i>M</i>	<i>SD</i>
Social norms (3 items)	4.66	1.42
Habits (4 items)	4.18	1.71
Convenience	4.33	2.11
Perceived behavioural options	3.17	1.52
Financial barrier	3.44	1.99
Intention to reduce plastic bag consumption	5.93	1.20
Belief that fully recycled plastic bags will resolve plastic pollution	5.71	1.52
Self-reported behaviour (bring own bag)	4.34	2.25
Negative emotions status quo	3.03	1.16
Negative emotions after narrative future vision intervention	1.61	0.81
Positive emotions status quo	3.50	0.93
Positive emotions after narrative future vision intervention	4.51	0.74
Ascription of responsibility (AR) status quo	4.04	1.02
Ascription of responsibility (AR) after narrative future vision intervention	4.09	1.10
Perceived behavioural control (PBC) status quo	2.67	1.33
Perceived behavioural control (PBC) after narrative future vision intervention	3.47	1.38
Behavioural intentions (INT) status quo	4.37	0.68
Behavioural intentions (INT) after narrative future vision intervention	4.58	0.58

Table 4. Results multiple linear regression with ordinary least squares.

Variable	Estimate	<i>SE</i>	<i>t</i>	<i>p</i>
(Intercept)	3.27	0.66	4.99	< .001
Social norms	0.36***	0.36	5.59	< .001
Habits	-0.20***	0.20	-3.59	< .001
Convenience	-0.08	0.05	-1.78	.075
Perceived behavioural options	-0.15**	0.05	-3.18	.002
Plastic bag cost	-0.01	0.04	-0.23	.819
Intention to reduce plastic bag consumption	0.18*	0.08	2.39	.017
Belief that fully recycled plastic bags will resolve plastic pollution	0.01	0.06	0.09	.925

Note. *** = $p < .001$; ** = $p < .01$; * = $p < .05$

Main findings from survey data:

- Social norms were identified as the strongest, positive predictor of bringing a reusable bag to the store;
- Habits to buy single use bags at the store have been found to be negatively related to bringing a reusable bag;
- Intentions to reduce plastic bag use are positively related to the self-report of bringing reusable bags to the store;
- Perceived behavioural control has been found to be positively related to bringing reusable bags to the store;
- Perceptions about the bags being made of recyclable content did not have a significant effect on self-reported behaviour;

- Our respondents did not seem to be influenced by the costs associated with the plastic bag purchases. This points towards the ineffectiveness of the financial barrier implemented by the South African government to limit the amount of plastic bags consumed.

Table 5. Results of the observations

	Overall (%)	Teller action		
		1 (%)	2 (%)	3 (%)
Observations	N = 322	n = 56	n = 210	n = 56
Bought plastic bag	196 (60.9)	9 (16.1)	139 (66.2)	48 (85.7)
Bought paper bag	2 (0.6)	0	2 (1.0)	0
Bought reusable bag	3 (0.9)	0	3 (1.4)	0
Had own bag of any type	51 (15.8)	20 (35.7)	25 (11.9)	6 (10.7)
Bought plastic bags in addition to own bags	7 (2.2)	0	5 (2.4)	2 (3.6)
Forewent buying any bag	78 (24.2)	28 (50.0)	46 (21.9)	4 (7.1)
Plastic bags bought in total	455	17	331	107
Mean	1.41	0.30	1.58	1.91
Median	1	0	1	1
<i>SD</i>	1.86	0.87	1.93	1.93

Note. 1 = teller did not ask customers if they wanted a bag nor packed shopping items directly, 2 = teller asked customers if they wanted a bag, 3 = teller straight away packed shopping items without asking.

Main findings from observation data:

- Observations revealed that the majority of observed customers bought one or more plastic bags during their shopping routine.
- We further observed that the behaviour of the teller was related to significant differences in the amount of plastic bags consumed.
- Packing the groceries in plastic bags on behalf of the customer without verbal interaction led to the second highest rate of plastic bags.
- Significantly fewer plastic bags were acquired when the teller did not ask the customers if they want a bag and if the groceries were not packed by default, potentially because the customer was forced to purposefully ask for a bag in these instances.
- This indicates the effectiveness of behavioural nudges, making the unsustainable behaviour inconvenient or more effortful.
- Another factor influencing whether the teller would ask about a bag was if customers brought their own reusable bags, eliminating the need for additional plastic bags.
- These observations suggest the existence of unspoken behavioural patterns surrounding plastic bag acquisition, with some encouraging automatic packing of goods and others discouraging bag use when only a few items are purchased.

We also plan to publish these results to a wider audience as Paper 2: *Why do consumers bring their own bag to the shop? A multi-methods approach* (see Table 2 above).

7.2. Study 2 (paper 3; data set 4)

A summary of the main findings of the analysis of data set 4 are provided in Tables 6 and 7 and are briefly summarised below:

Table 6. Mean and Standard Deviation for all variables included in the model (predictors and dependent variable)

Variable	<i>M</i>	<i>SD</i>
Negative emotions status quo	3.03	1.16
Negative emotions after narrative future vision intervention	1.61	0.81
Positive emotions status quo	3.50	0.93
Positive emotions after narrative future vision intervention	4.51	0.74
Ascription of responsibility (AR) status quo	4.04	1.02
Ascription of responsibility (AR) after narrative future vision intervention	4.09	1.10
Perceived behavioural control (PBC) status quo	2.67	1.33
Perceived behavioural control (PBC) after narrative future vision intervention	3.47	1.38
Behavioural intentions (INT) status quo	4.37	0.68
Behavioural intentions (INT) after narrative future vision intervention	4.58	0.58

Table 7. Results of means and standard deviations of study variables after viewing each video and results of the dependent sample t-tests

Study variables	<i>N</i>	Status Quo video (<i>M, SD</i>)	Future Vision video (<i>M, SD</i>)	<i>t(df)</i>	<i>p</i>	<i>d</i>
1. Pos. Emotions	340	3.50 (0.93)	4.51 (.74)	-19 (338)	<.001	1.026
2. Neg. Emotions	340	3.03 (1.16)	1.60 (.81)	19 (339)	<.001	1.004
3. PBC	341	2.67 (1.33)	3.47 (1.38)	-9.4 (340)	<.001	0.511
4. AR	341	4.04 (1.02)	4.09 (1.10)	-1.1 (340)	0,1	
5. INT	342	4.37 (.68)	4.58 (.58)	-6.9 (341)	<.001	0.373

Note. P-values one-tailed.

Main findings from online survey data:

- Engaging with an optimistic future scenario leads to a significant shift in emotional states characterized by a greater experience of positive emotions and a reduced experience of negative emotions when compared to a Status Quo scenario.
- The implemented intervention has a positive impact on individuals' confidence in their ability to adopt sustainable consumption practices of plastic bags (perception of behavioural control (PBC)).
- Findings reveal an increase in behavioural intentions toward more sustainable use of plastic bags following the exposure of the Future Vision video.
- No significant differences were observed between viewing the Status Quo and Future Vision video regarding the ascription of responsibility.
- The initial measurement point of ascription of responsibility already exhibited high levels of responsibility scores, which can be a potential explanation for the lack of effect. The high scores make improvement through the Future Vision video less likely due to the participants' already elevated sense of responsibility prior to the intervention.
- The employed communication intervention can be considered an effective tool for eliciting psychological, emotional engagement and behavioural intentions. However, the effects on the ascription of responsibility remain uncertain.

We also plan to publish these results to a wider audience as Paper 3: *Using Narrative Future Vision Communication as a Tool for Sustainable Behaviour Change in the Case of Single-Use Plastic Bag Consumption* (see above).

8. Conclusion and thanks

The project team wish to acknowledge and thank the funder for the contributions towards the project on the *Human dimension of plastic pollution in South Africa: Building capacity to understand behavioural drivers*.

We believe that we have achieved and exceeded the objectives that were set out in the initial funding proposal. We also trust that the activities and outputs from this project will be useful towards reducing the consumption of plastic carrier bags in South Africa.

<<End of this report>>