Developing the Biomaterials Industry in
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Webinar

Unlocking Demand for South Africa's Biomaterials

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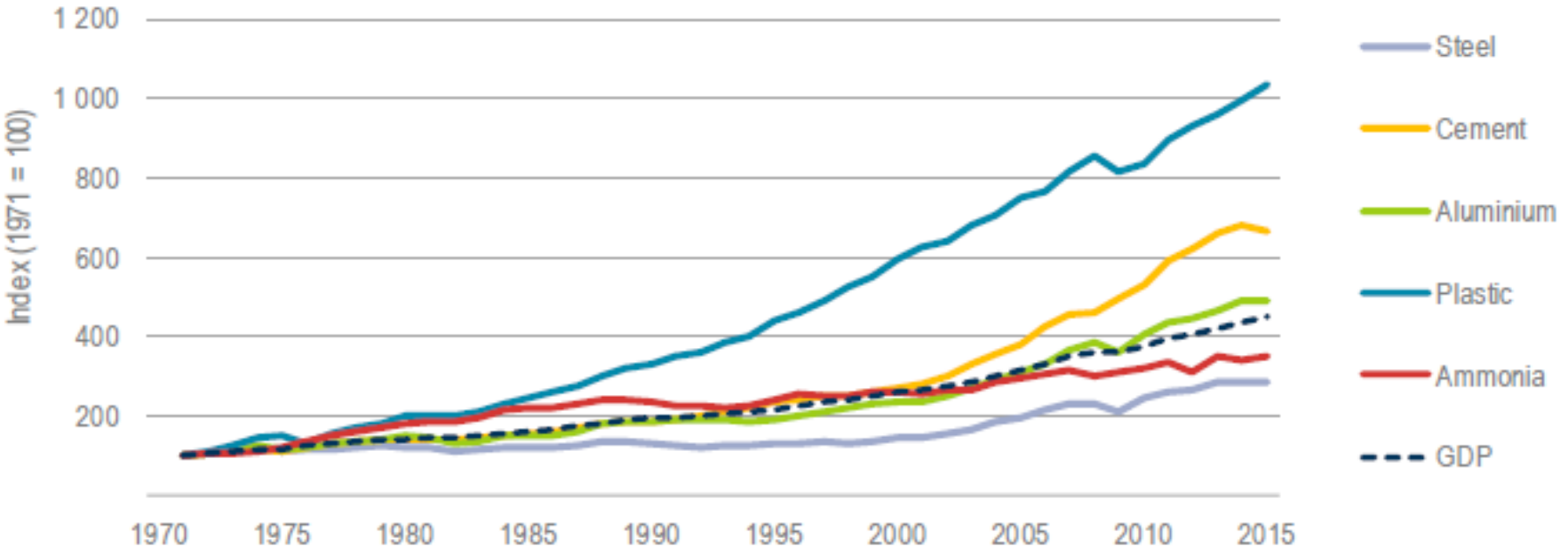
Problem statement

- A lot of focus geared towards biofuels however there are other applications – bioplastics, biochemicals, etc.
- Other bio-based products get relatively less attention and focus
- A lot of effort is devoted to developing the supply-side through R&D, financing, etc.
- But more attention needs to be paid on developing the demand side
- Sustainable markets need a catalyst in the early stages

- Builds upon previous study on supply-side dynamics in SA
- Focus on bioplastics and examine the policy levers that can be used to stimulate demand
- Process involves review of policy precedent in other countries combined with market investigation

Plastics are essential to modern lives

Production growth for selected bulk materials and GDP

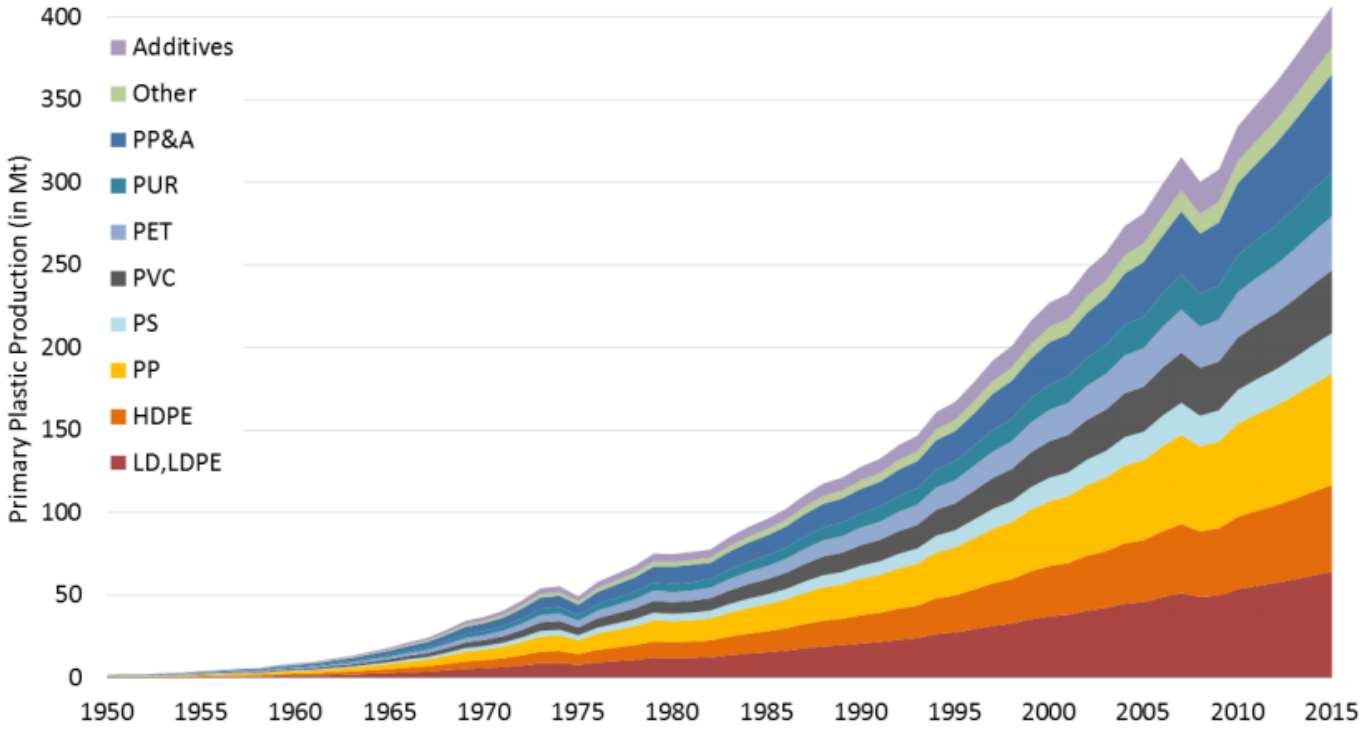


Demand for plastics
has grown faster than that for any other group of bulk materials

Source: IEA 2018

Plastics are essential to modern lives

Global primary plastics production according to polymer type, 1950 to 2015

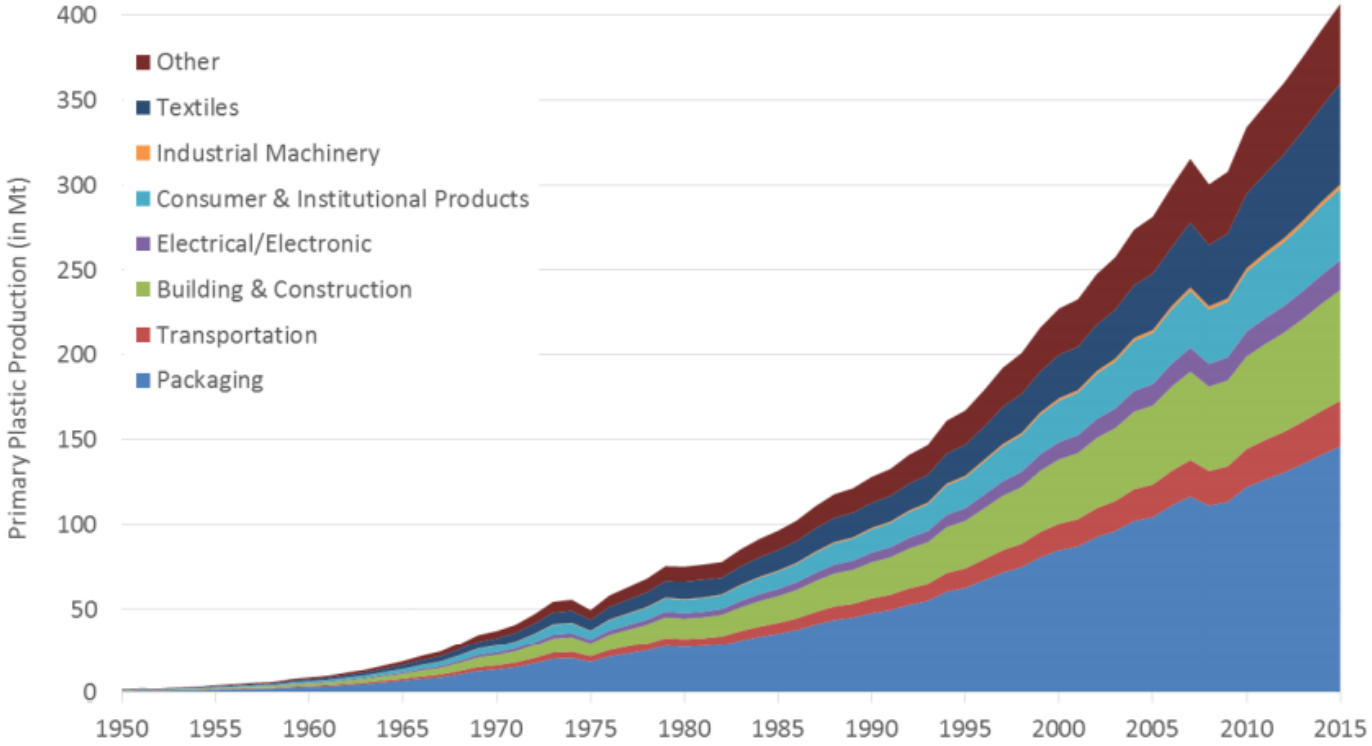


Polyethylene, polypropylene, and polyvinyl chloride (PVC) account for ~70% of production volumes

Source: Geyer et al., 2017a, 2017b

Plastics are essential to modern lives

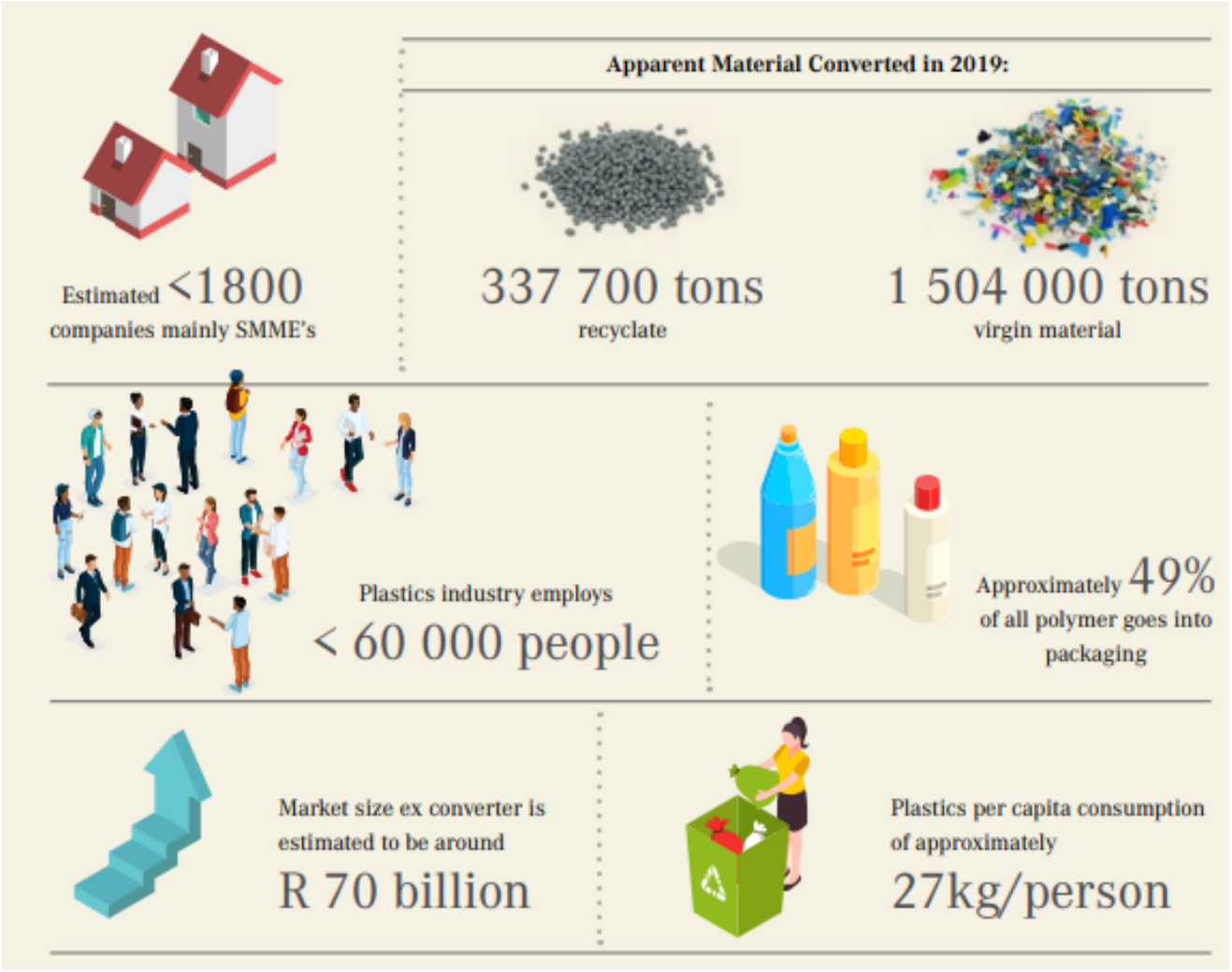
Global plastics production by industrial use, 1950 to 2015



Packaging and building and construction account for ~61% of demand for plastics

Source: Geyer et al., 2017a, 2017b

SA Plastics



Source: Plastics SA

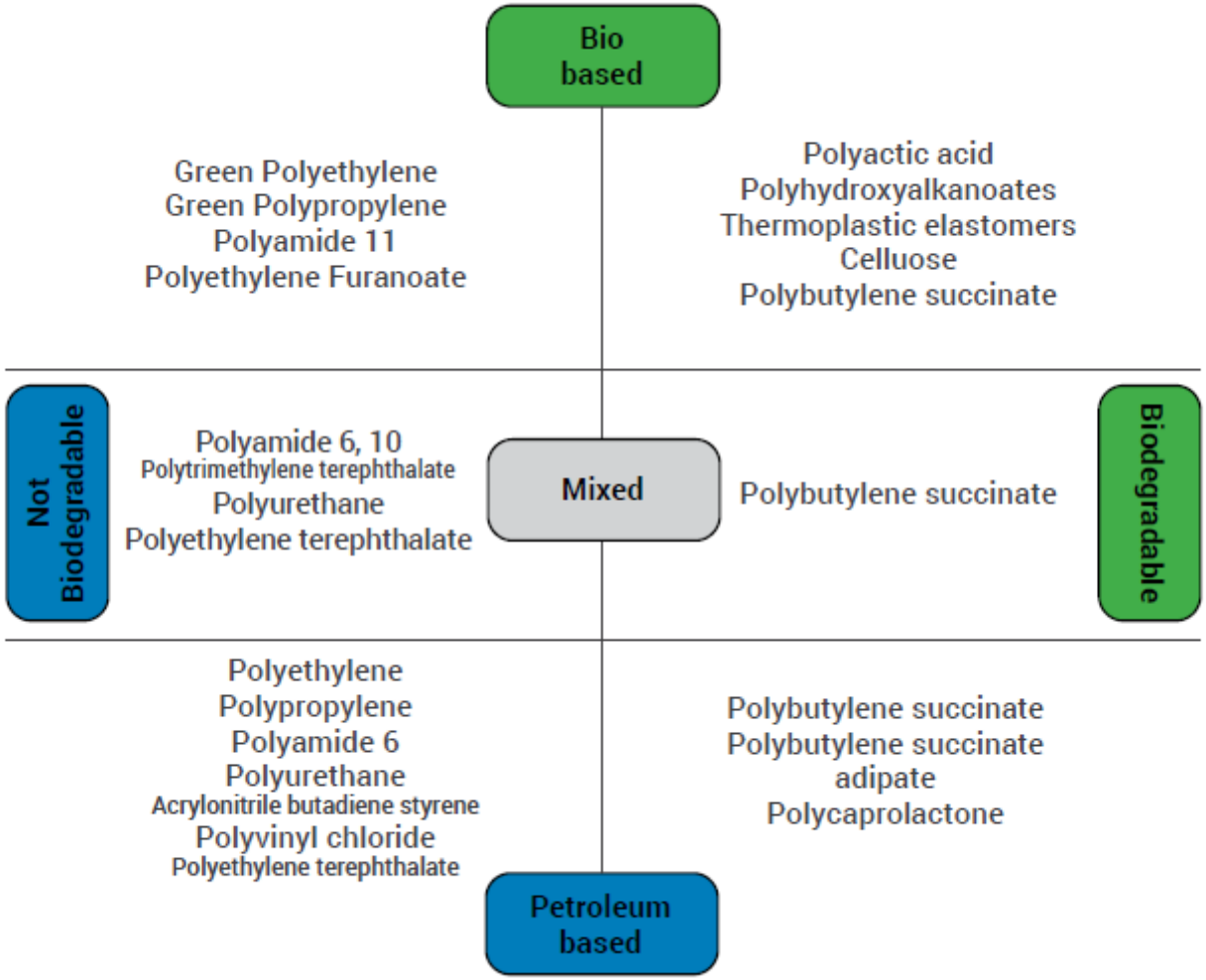
Applications and markets of bioplastics

Biopolymer/plastic feedstocks and uses

Biomass component	Precursor	Uses	Degradability characteristics
Starch-based polymers	Starch	Packaging; Food trays; Trash bags; Flower pots	Degradable in: Water; Soil; Compost
PHA/PHB/PHV	Polyhydroxyalkanoates (PHAs)	Packaging; Adhesives; Fibers; Medical Implants	Degradable in: Water; Soil; Compost
Polylactic acid (PLA)	Lactic acid	Packaging; Textiles; Medical implants Films	Degradable in: Soil; Compost
Cellulose-based polymers	Cellulose	Wound dress; Textiles; Air filters; Coatings	Degradable in: Water; Soil; Compost
Polyethylene	Ethanol	Bottles; Ship container; Container lids; Adhesives	None
Polyvinyl chloride (PVC)	Ethanol	Packaging; Window frames; Railings; Pipes	None
Protein-based polymers	Amino acids	Cast film; Injection molds; Compression molds; Extruder sheets	Degradable in: Water; Soil; Compost

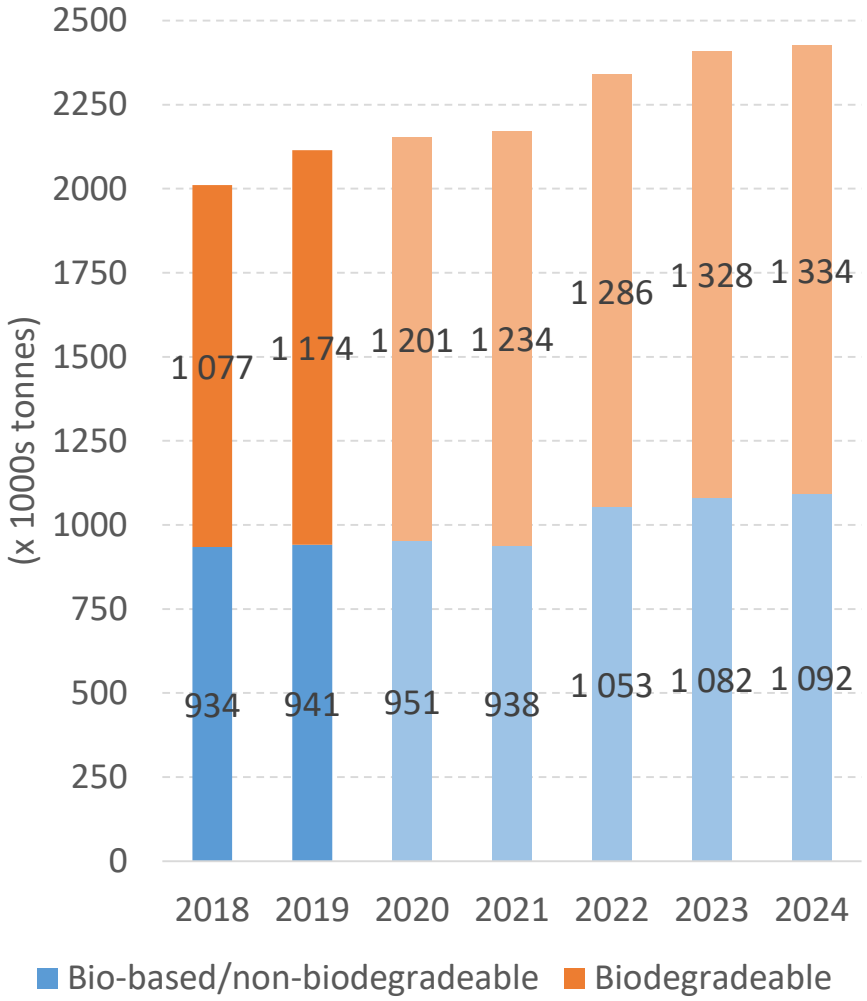
Source: TIPS, based on Karan et al., 2019

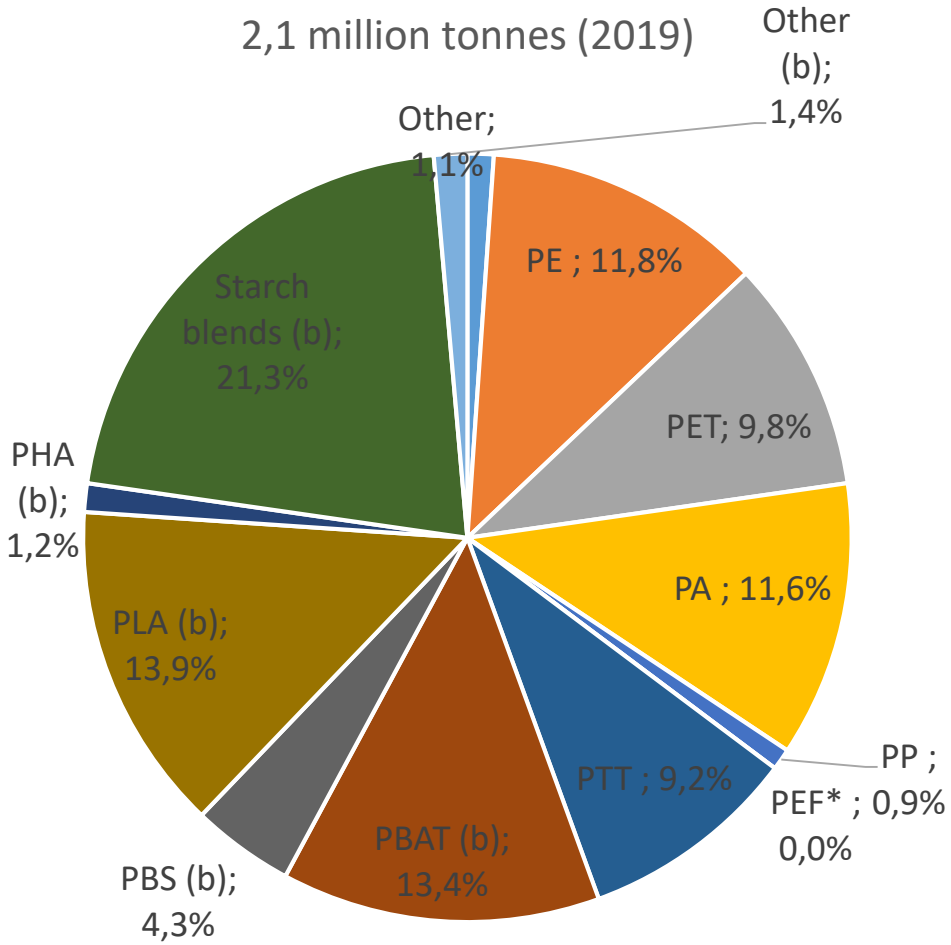
Distinguishing bioplastics



Market trends

Global production of bioplastics





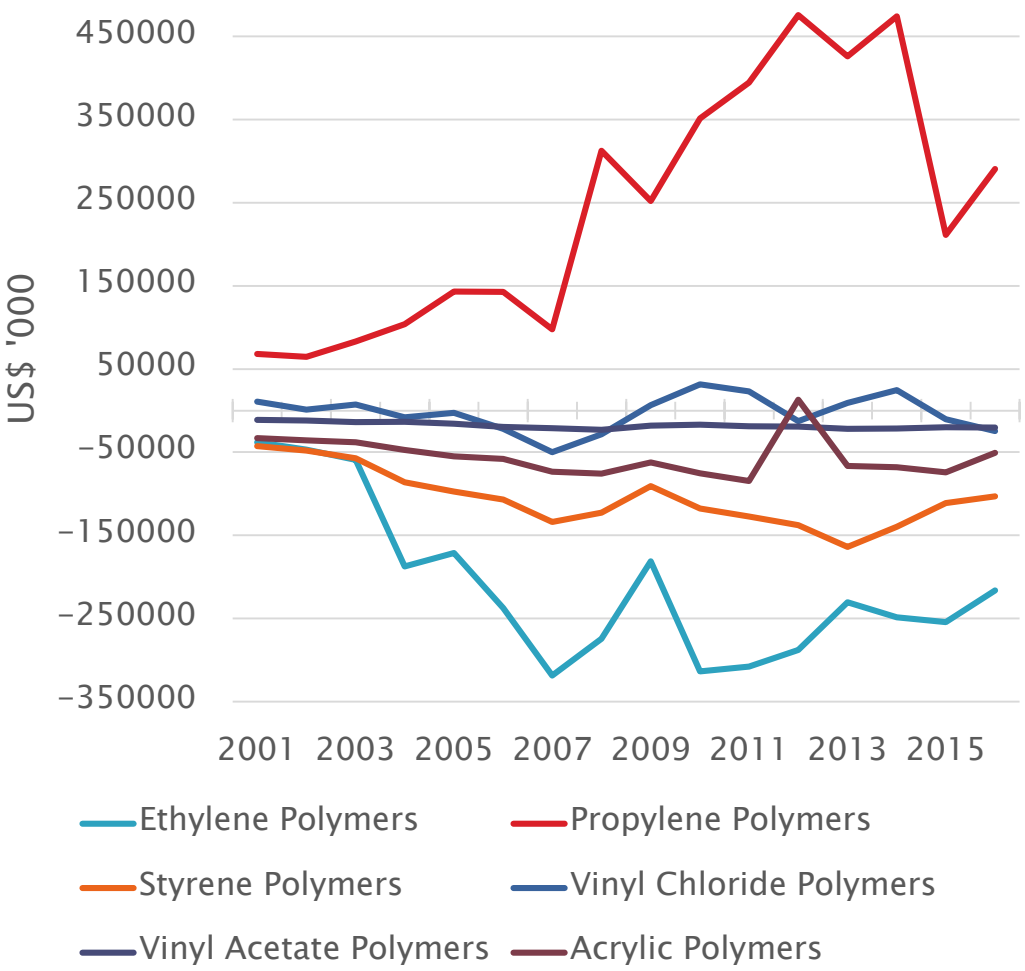
Non-biodegradeable = 45%

Biodegradeable = 56%

Source: TIPS, based on European Bioplastics data

Market trends

Net South African trade in plastics polymers



- Penetration of biomaterials-based production in SA still very low
- As with emerging and new technologies, cost-parity with fossil fuels requires scale and market development

- Small number of firms involved in production (with some spin-off firms from CSIR, e.g. OptimusBio)
- Research capacity in the CSIR and other research institutes, as well as biomedical department/units throughout research/tertiary institutions

Source: TIPS, based on Trademap data

SA bioplastics demand profile

- Current demand is small, however increasing pressure on firms from sustainability perspective
- Outlook looks promising – future demand likely to be driven by large international MNOs, domestic firms and through industry collaboration initiatives.
- MNOs: Coca-Cola/Safripol; Unilever
- Domestic firms: Growthpoint; Woolworths
- Proximal demand for "drop-in" bioplastics

Collaborative initiatives

South African Initiative to End Plastic Pollution in the Environment

- Aims to reduce plastic pollution
- Includes a number of private firms, PROs, state organisations, and UNEP

SA Plastic Pact

- Aims to stimulate industry led innovation, dialogue and collaboration
- create new business models, jobs, unlock barriers towards circular economy for plastic

SA bioplastics supply dynamics

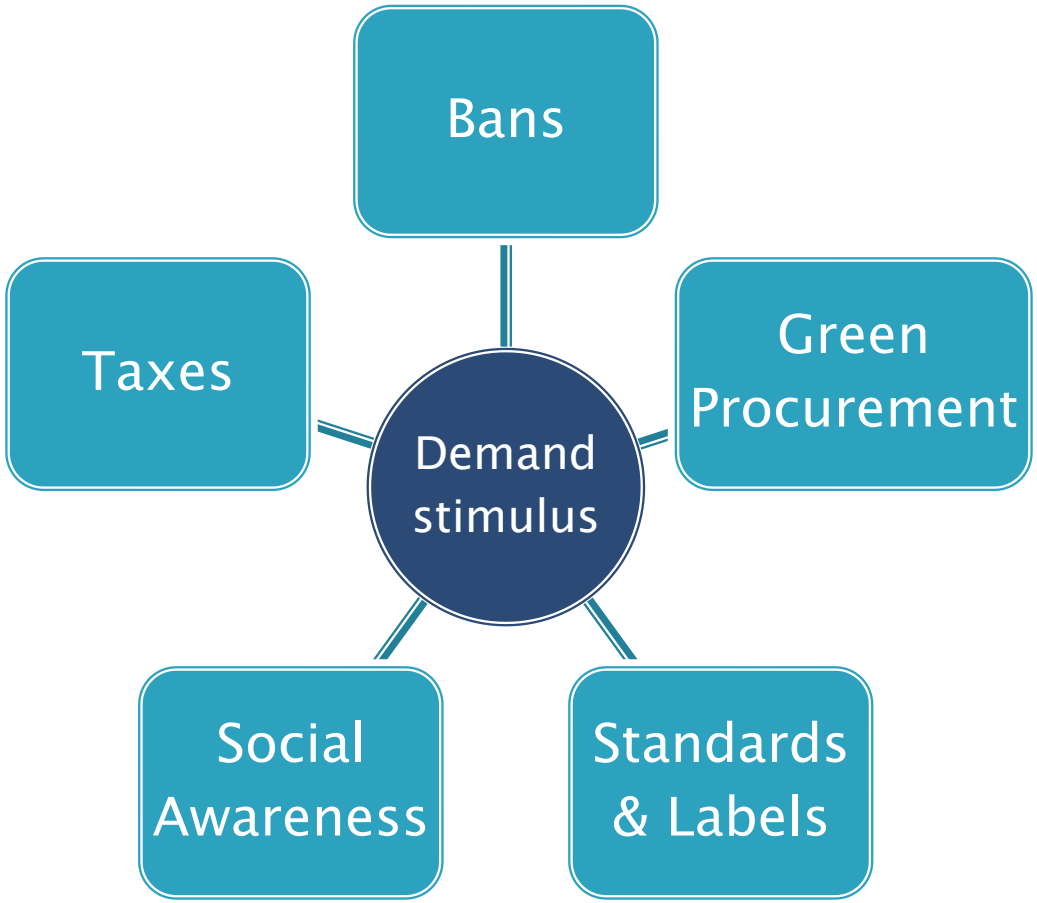
- Like the global picture, currently bioplastics supply occurs on a small scale
- Research efforts currently spearheaded by CSIR and university initiatives, with DST support
- Private sector suppliers
  - SAPPI Biotech
  - Safripol
  - Lignotech
  - OptimusBio
  - Polyoak
- Barriers include innovation environment, feedstock and competitiveness

Key interventions required:

- Feedstock matching
- Bridge research funding
- Support for pilots
- Priority clusters for platform chemicals
- Industry partnership task team
- Secondary interventions include training programs, awareness, standards, feedstock trade, industrial policy

See the full report on supply-side dynamics in SA here

Policy options to support demand



Policy option – Bans

- Bans on plastics and other polymers consist of restrictions or prohibition of a particular type, specification, combination or production levels.
- Bans can apply to the manufacture, sale, retail distribution and import of plastic and other polymers.
- These policy mechanisms can serve to increase demand for bioplastics as consumers have to switch to alternative products.

Variations

Geographic scope
- National, regional or municipal

Bans on product characteristics
- The physical properties of the plastic such as size, thickness, biodegradability or recycled content

Production/ manufacturing limits
- Bans which prevent or limit the market entry of plastics

Full or partial bans
- Full bans prohibit **all** single-use plastics
- Partial bans only on certain products (e.g plastic bags, utensils)

Bans on retail distribution

A full ban would apply to all retail distributors while a partial ban would apply to a particular segment of the retail market

Effectiveness of bans

Full bans and production limits

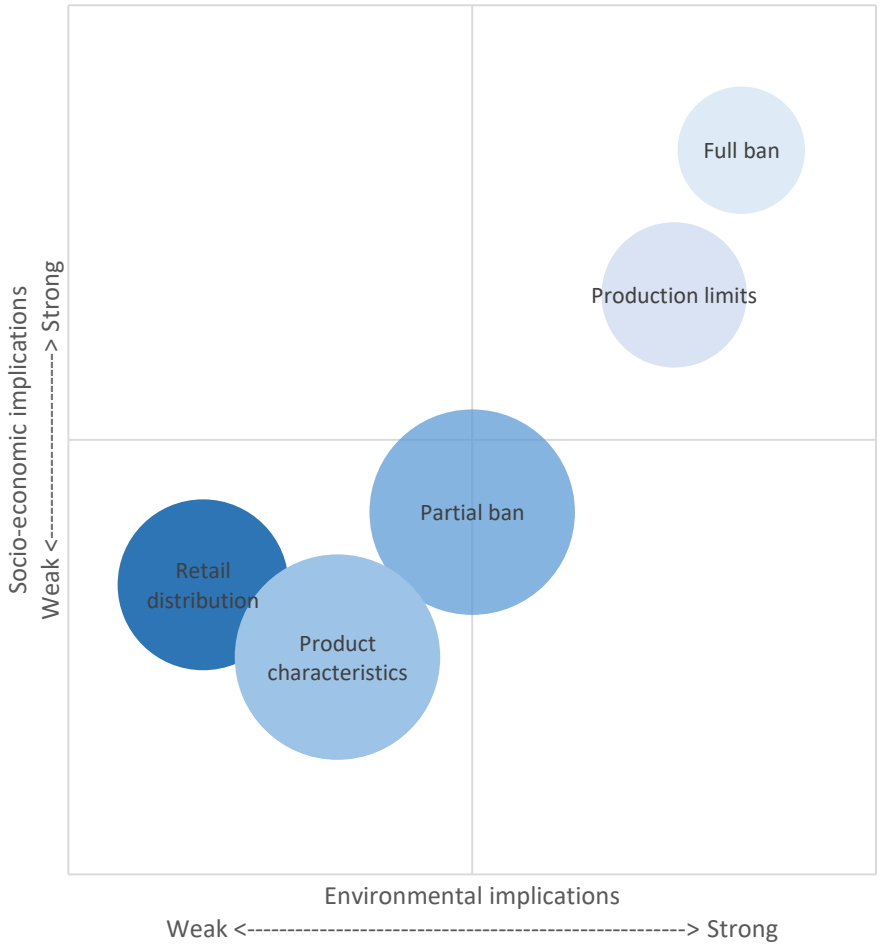
- Yield strongest environmental impacts and have high socio-econ implications

Partial bans:

- Socio-econ impact is relatively weaker than production limits and full bans, the environ implications are weaker as more products can enter the market

Retail distribution bans

- Have relatively weaker socio-econ impacts and environ implications compared to the variants as more plastics enter the market from other distribution points



Approaches to bans

Strong approach: Rwanda

- 2008 national-wide partial ban on the mfng, use, sale and import of all non-biodegradable plastic bags
- Enforcement with strict penalties and stakeholder consultation
- Ban combined with tax incentive for investment in recycling equipment and mfng of environmentally-friendly bags

Strong to moderate: Kenya

- 2017 ban on the mfng, import, distribution and use of thin plastic bags
- Enforcement with strict penalties
- Use of plastic bags significantly reduced but plastic bags still common in slums and rural areas

Moderate to weak : Bangladesh

- 2002 ban on polythene plastic bags
- Initial positive response but reversed due to a lack of enforcement
- In 2010, stricter penalties introduced but lack of enforcement resulted in continued use plastic of bags

Policy option – Taxes or levies

- Charges levied on consumers and business for the sale, import, production of conventional plastics.

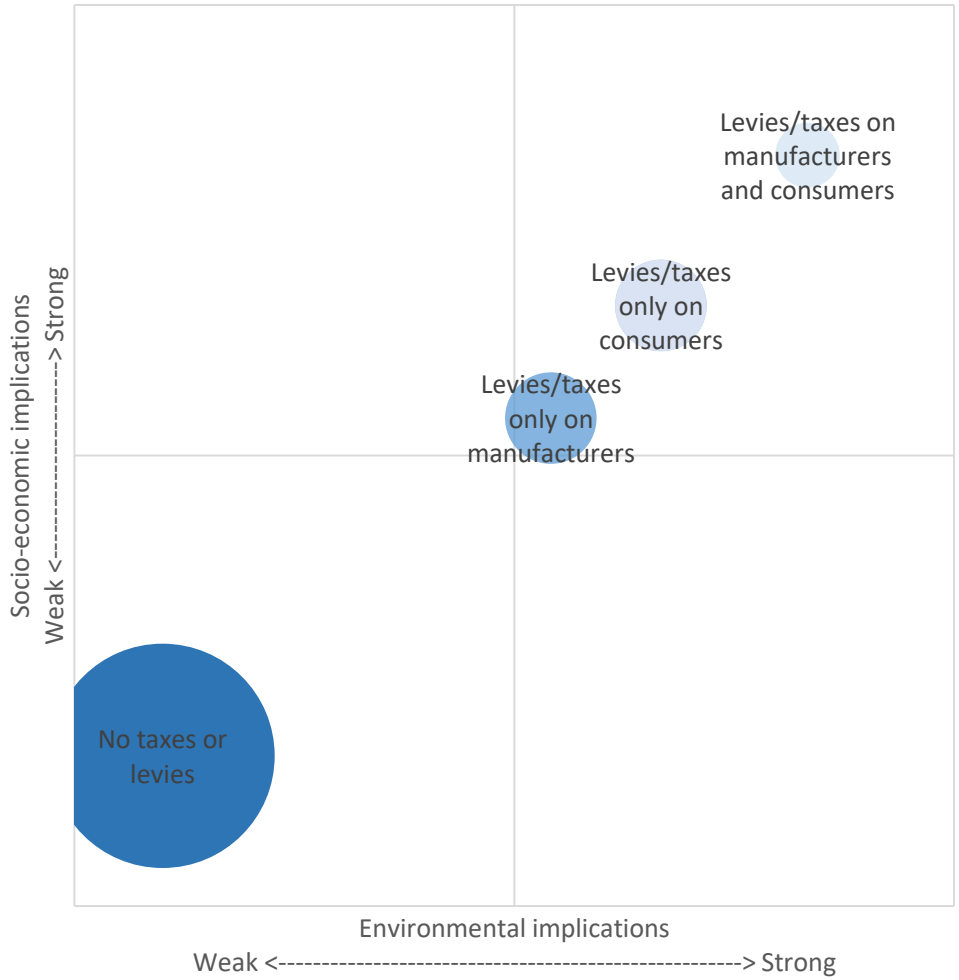
- Taxes are a mechanism to foster demand for bioplastics by increasing the cost of consumption of conventional plastics incentivising consumers to switch to alternatives, such as bioplastics.

Variations

- Producer, wholesale or consumer level
  - tax is charged directly to consumers at the point of sale (supermarkets and other sales outlets)
  - taxes levied at the manufacturing stage
  - tax or fee instituted at the wholesale level, where retailers incur the cost and have the flexibility to pass on the costs to final consumers
- Judicial level of implementation (national or local)
- Product characteristics (thickness, size, biodegradability)

Effectiveness of taxes and levies

- Taxes or fees are primarily instituted to change behaviour
- Effectiveness depend on the price which needs to be high enough to change behaviour.
- Taxes on both mfng and consumers yield the strongest environ impact and socio-econ implications
- Taxes/levies only on mfng most effective when the tax are transferred to the end consumer



Approaches to taxes

Strong approach: Ireland

- 2002 tax on plastic bags at point of sale for consumers
- Extensive stakeholder consultation on the design and implementation
- Surveys conducted to determine consumer's willingness to pay taxes
- Tax rate set 6x the willingness to pay

Strong to Moderate: Wales

- 2011 levy on single use carrier bags
- Voluntary campaign "Bags for life" (BfL) promoted reusable bags
- low cost of BfL lead to consumers reusing bags as throw-away bags
- Levy maintained since 2011, with consumers supporting increase in 2019

Moderate to weak: Botswana

- 2007 tax on plastic bags
- retailers could set the price for plastic bags
- Lack of tax revenue collection mechanisms
- Public support fell as the revenue from the plastic tax has not been collected from retailers who continue to charge consumers

Policy option – Standards and labels

- Standards and labels specify the product and characteristics, indicating the sustainability and eco-friendly elements of the product.
- Standards and labels for bio-based products are classified under ecolabels.

- Ecolabels are a voluntary method of environmental performance certification and disclosure, which encourages sustainable consumption and production and promotes green markets.
- Ecolabels raise awareness and can increase the demand for sustainable alternatives to traditional products.

- Countries that have embarked on green procurement policies have typically preceded this policy by developing policies around ecolabels.
- Eco-labelling simplify government public procurement and reduce the administrative costs.

Variations of standards and labels

The ISO differentiates between type 1, 2 and 3 ecolabels

Type 1: the **strongest** form of certification, based on multiple criteria, licensed by 3rd party, and may involve a LCA

Type 2: **self-declarations** based on guidelines, where claims should be verifiable and accurate

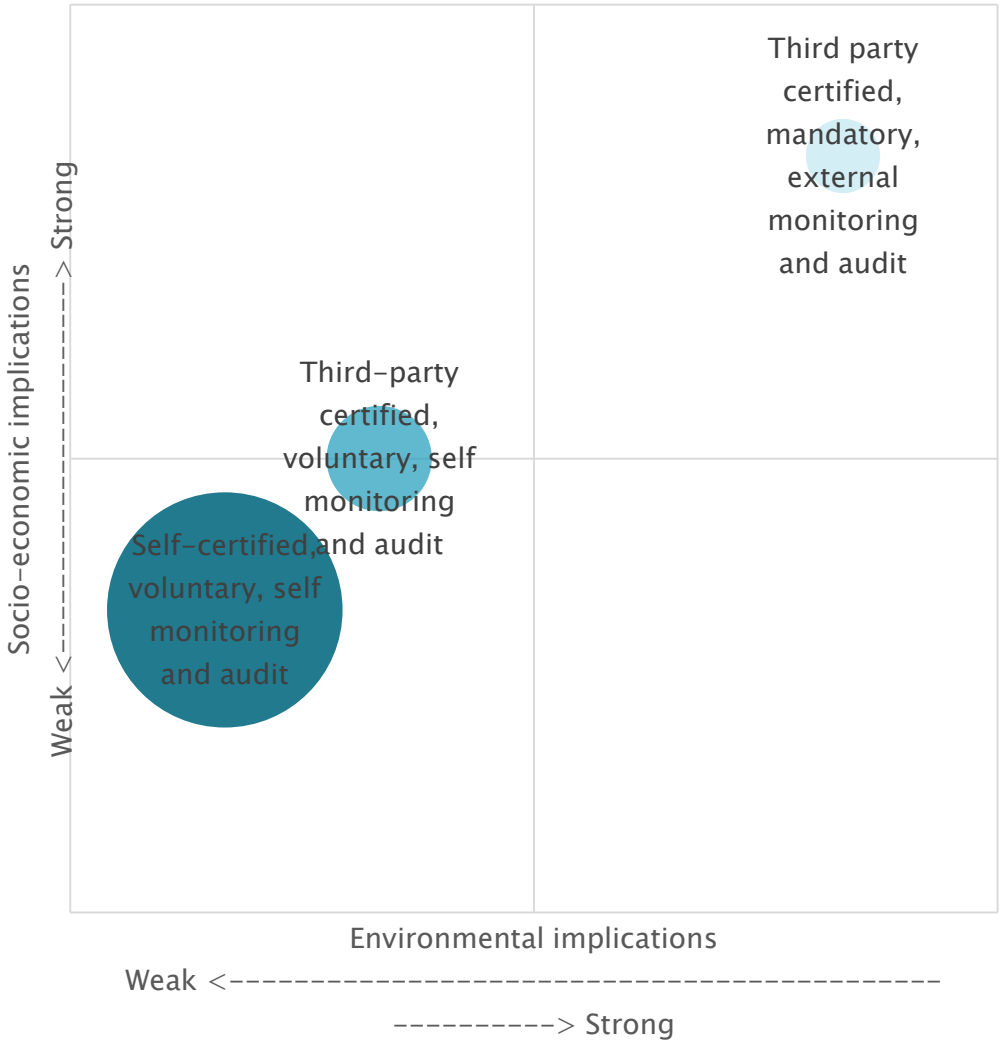
Type 3: use **quantitative indicators** of env performance based on a LCA for objective comparisons

Standards and ecolabels differ in their specification and implementation

- Sectoral scope of coverage
- Sustainability content
- Type of sustainability assessment: full LCA vs. non-LCA
- Governance: mandatory or voluntary

Effectiveness of standards and labels

- Effectiveness largely depends on the public familiarity and trust with the standard and label
- Third-party certified SCL yield the strongest envir. and socio-eco. implications as they verified by a third party and include external monitoring and auditing



Approaches to standards and labels

Ambitious and growing: China

- Environmental Labeling scheme voluntary with labels valid for 3 years subject to review and renewal
- Success based on regular updates to labels and expansion of products and categories
- GPP ecolabels and energy labels create strong incentives for mnfctrers to design, build and create greener products

Moderate success with challenges: Thailand

- No formal legislation for ecolabels
- Environmental Quality Management Plan (EQMP) is used to increase the prevalence of ecolabels
- Challenges have prevented further uptake of products with ecolabels
  - Voluntary GPP policy
  - Lack of a national footprint of products with ecolabels

Policy option – Green Public Procurement

- Green public procurement (GPP) involves the procurement of 'green products' by the state.
- Given the size of the state as a consumer, GPP can increase demand for green products and bio-based products.
- GPP is typically linked with other environmental policy instruments, such as standards and ecolabels.

Variations

Targeted group: national, subnational, local government levels or state-owned institutions

Stage of the value chain: GPP criteria applied to different stages of the value chain, (e.g. requiring use of reusable/recycled plastics

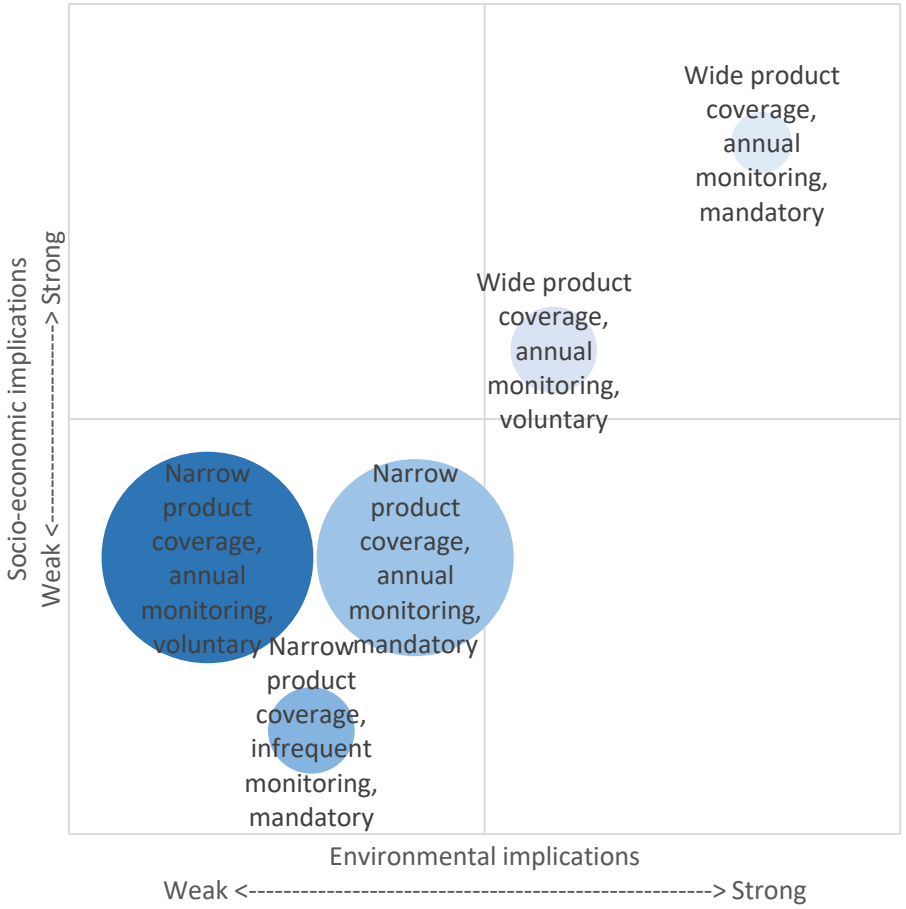
Synergies with social and political considerations: criteria incorporates the skills development, environmental sustainability and inclusivity

Governance: mandatory or voluntary

Extent of green procurement: broad or narrow range of goods and services

Effectiveness of Green Public Procurement

- Key to the effectiveness of GPP is a comprehensive standards and labeling framework
- Mandatory GPP which includes wide product coverage and annual monitoring yields the strongest environ and socio-econ impact
- Voluntary GPP with narrow product coverage and infrequent monitoring yields the weakest environ and socio-econ impact



Approaches to Green Public Procurement

Strong leaders in Asia

South Korea

- Act on Promotion of Procurement of Eco-friendly Goods
- State agencies set voluntary targets
- Green Products Information System (GPIS), an online platform with reporting and monitoring of GPP

Japan

- Act on Promotion of Procurement of Eco-friendly Goods and Services by the State and other Entities
- Mandatory for all government agencies across variety of product categories
- cooperation between government, NGO/NPOs and suppliers

Ambitious but lacking in governance: Thailand

- GPP voluntary and decentralized
- lack of a national eco-labelled products footprint
- Implementing agencies responsible for own tracking systems
- Awareness and training not been uniformly applied across implementing agencies

Policy option – Social awareness

- Social awareness involves persuasion and education of the general public regarding sustainability of low-carbon and/or bio-based products which increases their demand.
- Can be initiated by the state and/or by private stakeholders.
- Requires regular and engaging messaging through appropriate channels.

Variations

Traditional media: television, radio and newspapers

Education: school curriculums

Social nudging: +ve reinforcement to consumers through small incentives/in-store signs/ messaging

Online media: social media, online news outlets, websites, podcasts, blogs

Awards, rewards and other incentive programs

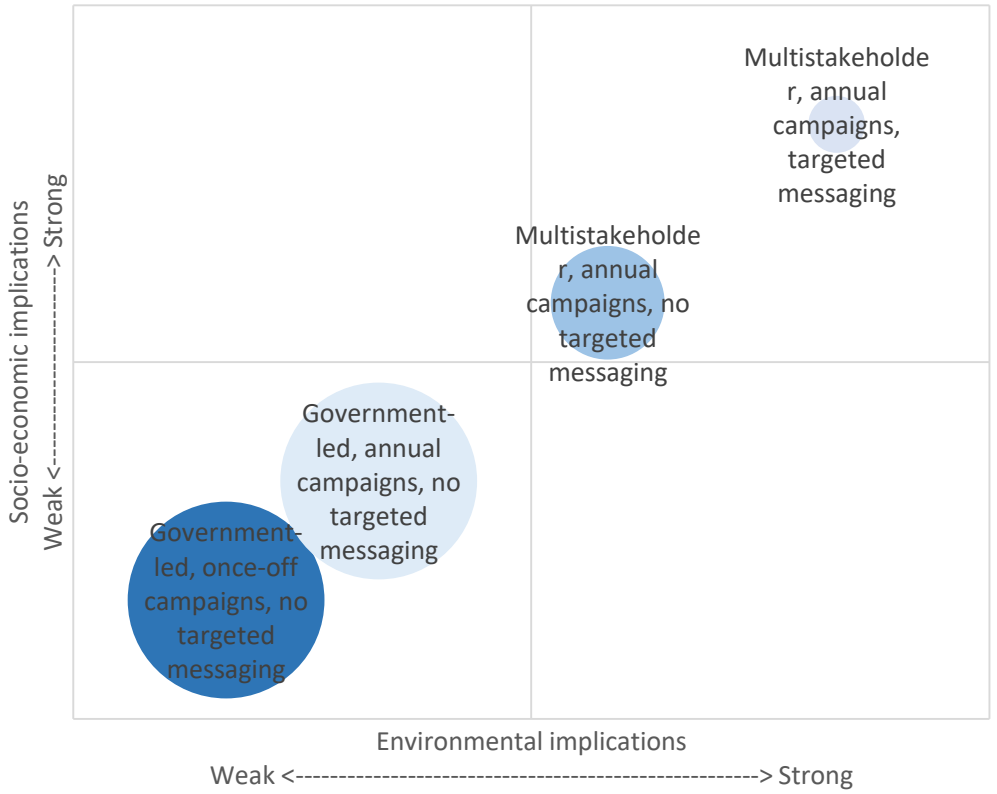
Social proofing: using experts, celebrities and influencers to promote, endorse and recommend bio-based products

Promotional activities: conferences, workshops, demonstrations

Product labeling: eco-labels

Effectiveness of social awareness

- The strongest environ and socio-econ impact occurs with social awareness campaigns
- Campaigns are informative, engaging, targeted, consistent and involve multiple stakeholders and channels.



Important that social awareness campaigns consider differences in demographics and equity as the messaging will be received differently by different people

Approaches to social awareness

Go Green campaigns: Malaysia

- State partnership with NGOs introduced Go Green campaigns to encourage green behavior and sustainable consumption
- Other campaigns include No Plastic Bag Day, 3Rs and environmental education
- higher likelihood of changed behavior for females, married, families with young children, higher incomes, higher education, and urban residences

Leveraging celebrities: Japan

- Fun to Share campaign – nationwide campaign to fight climate change
- Interest in climate change declined among people between the ages 18 and 26
- New efforts to capture young people's attention incorporating popstars, influencers and mascots

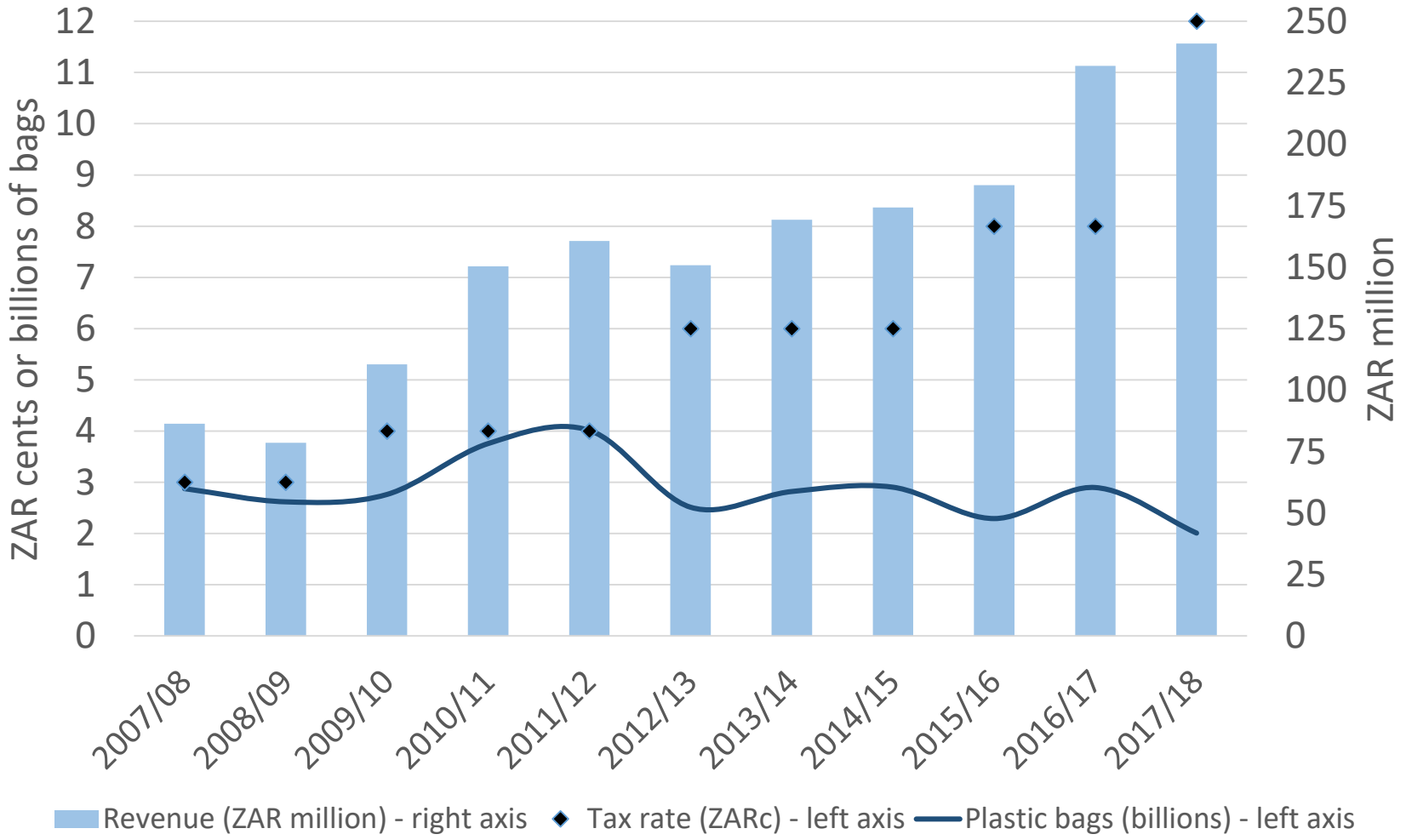
SA insights – bans and taxes

- SA currently has a ban on plastic bags <0.3 mm thick and a levy on the manufacturing on thicker bags.
- The levy has progressively been ramped

  3c (2004) → 12c (2017) → 25c (2020)
- DEFF currently in the process of amending plastic bag policies and introducing legislation on single-use plastic
- Is the current levy sufficient to deter plastic consumption and/or enable switching to bioplastics?

- Learnings from country experience
  - Extensive consultation
  - Accurate levy rate
  - Access to alternatives
  - Effective enforcement
- Empirical evidence indicative of short-term impacts of levies on plastic bag consumption
- However consumers are quick to absorb costs into budget

Plastic levy trend



Source: TIPS, based on NT data

Impacts – bans and levies

Costs

- DEFF: invest resources to assess bans/levies and impact
- Treasury: reduced levies from switch to bioplastics
- Producers: reduced demand and employment

Risks

- DEFF: poor enforcement of bans does not deliver results
- Plastic producers: insufficient ability to transition to bioplastic production
- Consumers: face higher costs downstream if bioplastics are not competitive

Benefits

- DEFF: reduced impact on plastics on environment, reduced litter
- Plastics industry: new capabilities + new export commodity
- Retailers: increased sustainability procurement

Implementation

- DEFF: stakeholder engagement and analysis of appropriate ban/levies
- dtic: incentives for bioplastic transition
- Producers: shift to bio-based production

SA insights – standards and labels

- A number of ecolabels already in the market with some SA labels (e.g. EcoProduct label)
- Ecolabels currently occur on a voluntary basis
- Increased visibility of ecolabels can increase demand for sustainable goods like bioplastics.
- Ecolabels can act as a catalyst for other mechanisms such as GPP

- SA has no overarching ecolabel framework with room for DEFF to play a role
  - Formulating ecolabel framework
  - Periodic monitoring / evaluation of labels on the market
  - Outline the acceptable ISO standards and types of assessments (e.g. LCA)
  - Connect with other countries to ensure best practice approach

Impacts – standards and labels

Costs

- DEFF: invest resources in developing ecolabel framework, monitoring, and creating awareness
- dtic: increased support for bioplastic transition
- Producers: increased consultancy and ecolabel costs

Risks

- DEFF: wasted resources from lack of change in consumer behaviour
- Plastic producers: lack of demand for labelled goods due to lack of knowledge/price
- Consumers: face higher costs downstream if labelled goods are more costly

Benefits

- DEFF: increase in sustainable consumption
- Plastics industry: increased sustainable production
- Retailers: increased sustainability procurement

Implementation

- DEFF: provide mandate to develop ecolabel framework, standards and monitoring
- Producers: adopt ecolabels on products
- Retailers: procure increased labelled goods

SA insights – Green public procurement

- No national-scale GPP in SA
- Some munics are progressive
  - CoCT, eThekwini, Ekurhuleni, NMB and Tshwane committed to incorporate green procurement into procurement practices
  - CoCT and eThekwini incorporated green procurement strategies into procurement
  - CoCT and NMB have stand-alone green procurement strategies
- Procurement in SA subject to PFMA, MFMA, PPPFA, PPFR, and NT regulations

- Learnings from country experience
  - Mainstreaming GPP in central government
  - Centralised procurement
  - Centralised platforms

Impacts – Green public procurement

Costs

- Government: increased costs of resources and training for GPP, increased input costs
- Producers: transition costs to align production with new GPP criteria

Risks

- Government: insufficient supply availability
- Plastic producers: insufficient ability to transition to bioplastic production

Benefits

- Government: state leads on sustainable consumption creating demand for bioplastics
- Plastics industry: new capabilities + new export commodity
- Retailers: increased sustainability procurement

Implementation

- Treasury/DEFF/dtic develop a national GPP framework
- Ecolabel framework and standards developed to ease GPP
- Producers: align production with GPP criteria

SA insights – Social awareness

- Awareness around plastics occurs however disaggregated
- Direct messaging on bioplastics is lacking
- Awareness around plastic use
  - DEFF
  - PROs (Plastics SA, PetCo)
  - Producers (Safripol)
  - Large retailers (Woolworths, Pick n Pay)
- Need for greater and consistent collaborative effects
  - South African Initiative to End Plastic Pollution in the Environment
  - the South African Plastics Pact

- Evidence indicative of gaps in education and school curriculum on climate change and plastics
- Learnings from country experience
  - Awareness and messaging has to be consistent
  - Targeted messaging accounting for income, age, education, geography and culture

Impacts – Social awareness

Costs

- DEFF: increased resources to large scale awareness campaigns
- DBE: increased costs for syllabus changes
- Producers: increase resources towards awareness

Risks

- Government: wasted resources due to a lack of change in consumer behaviour
- Plastic producers: wasted resources in awareness raising

Benefits

- DEFF: reduced plastic consumption and switch to bioplastics
- Consumers: increased education on plastic pollution and sustainable consumption

Implementation

- DEFF: targeted and frequent messaging on plastic pollution and bioplastics
- DBE: incorporate climate education into syllabus with greater intensity
- Producers: Increase efforts individually and through collaborations

Conclusion and way forward

Bans & Taxes:

- In 2018, Minister announced a potential ban on harmful single-use plastics (e.g. straws)
- DEFF has invited comment to amendments on plastic carrier bags and plastic flat bags.
- Is this sufficient? Possible expansion to all single-use plastics for retail consumption

Standards and labels:

- Many eco-label initiatives, e.g. EcoStandard (building), RSB (bioeconomy)
- What impacts?

Green Procurement Policy:

- No clear GPP
- room for wider adoption of GPP through national and local/municipal govt

Social awareness:

- Lots of activities – PlasticsSA, PETCO, WWF, SA Plastics Pact
- What impacts?

- Important to tailor demand policy to SA context :
  - State resources
  - Inter-department relationships
  - Consumer income
  - Ability of sustainable producers to serve the market

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