Modelling growth scenarios for biofuels in South Africa's transport sector

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Introduction

➢Transport is a major consumer of energy in South Africa, and is projected to grow substantially to 2050

➢South Africa has biofuels blending mandates of E2 - E10 for bioethanol and B5 for biodiesel. Aviation biofuels are being researched. But to date, there is very little production or blending.

➢Questions exist about how the volume of fuel demanded will be under different scenarios, and where this will come from.

➢Therefore, this paper establishes new estimates for the demand for fuel under different conditions, and assumptions.

Methods & Assumptions

We used a reduced form of the SATIM framework. This incorporates:

✓Technology-rich vehicle parc model;

✓Data on fuel sales from 2003-2009

✓Time horizon from 2006-2050

✓Four biofuel-based transport technologies are considered: conventional gasoline, diesel flex-fuel, aviation.

✓Three economic scenarios considered: GDP growth= 2.7%, 4.0%, 4.7%.

✓For land demand, we assumed yields for low (7000l/ha) and high (10,000 for fuel/ hectare). We assume all production is first-generation land and comes from crops.

Results

Figure 7: Demand for bioethanol by fuel blend and mode for the SO low economic growth case of the high flex-fuel penetration scenario

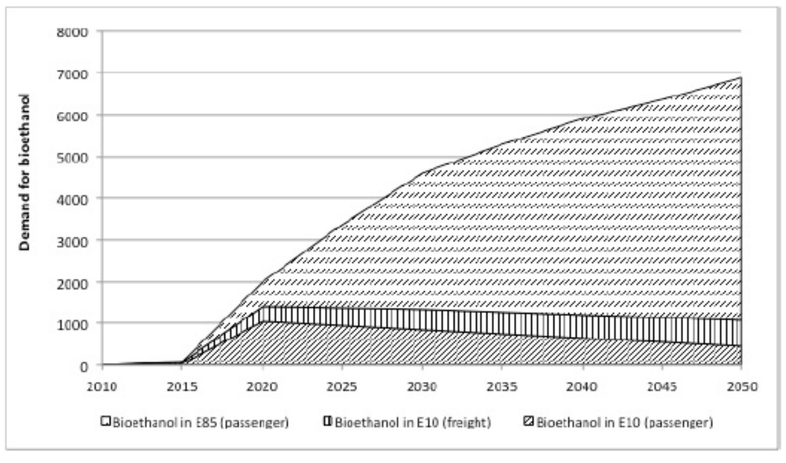

Figure 8: Estimated demand for bioethanol from road passenger and freight modes for the baseline scenario (E10) compared to the low-ambition scenario (E2) for three economic growth scenarios

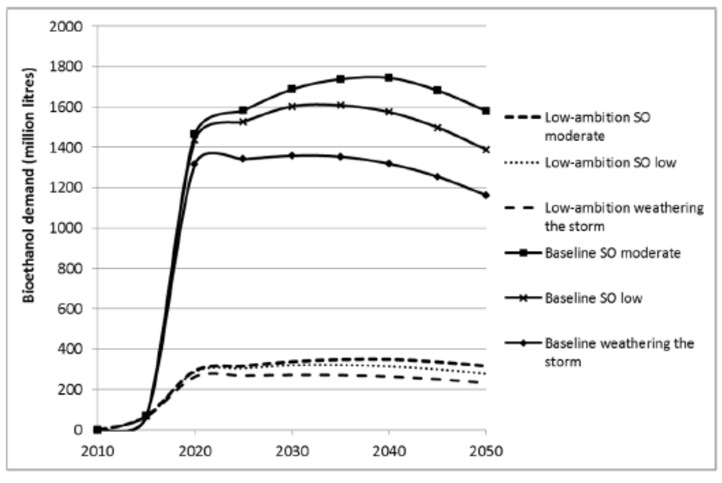

Figure 9: Estimated demand for biodiesel from road passenger mode only for a high flex-fuel penetration scenario compared to a no flex-fuel baseline for three economic growth scenarios

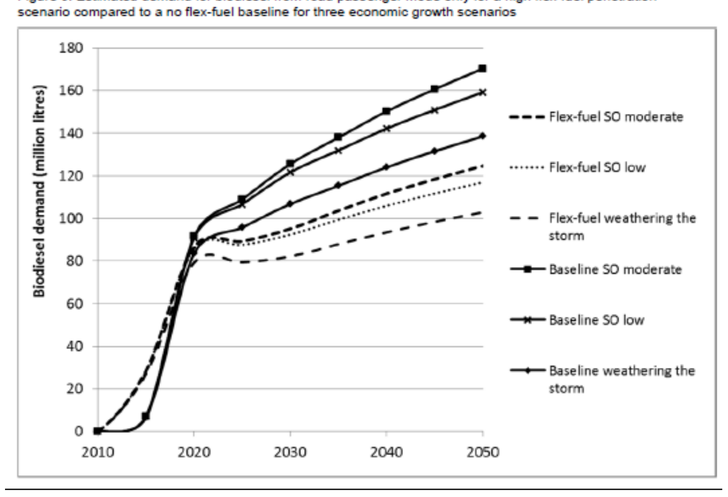

Table 9: Demand for land to meet bioethanol demand in 2035 under different yield and growth assumptions for economic growth scenarios

	Weathering the storm	SO low	SO moderate
Low yield (7000 litres per hectare)			
Zero E85; E10 mandatory blend	193,286	228,571	248,286
High penetration of E85	634,429	742,857	805,571
High yield (10,000 litres per hectare)			
Zero E85; E10 mandatory blend	135,300	160,000	173,800
High penetration of E85	444,100	520,000	563,900

Note: Land area figures in hectares.

➢Biodiesel is more land hungry due to lower yields: 1000l/ha -> 491,000 hectares

Key Findings

- ❖ At E10 and zero E85, by 2035, bioethanol demand is expected to be between 1353– 1738 million litres c. 4-5x present expected volumes (c.400 million litres).
- ❖ Under mandated levels of consumption, biofuel use will peak at 6.5% (E10) of all fuel consumption between 2020-2030.
- ❖ Under a zero E85 scenario i.e. meeting the blending requirements alone, South Africa will need to **either** divert large volume of sugar to biofuels, **or** import from abroad. If the market for flex-fuel cars develops, imports will be essential.
- ❖ Beyond meeting current mandates, important questions remain on penetration of flex-fuel cars, land use, trade and new technologies.

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