Introduction
Charcoal is a dominant energy source in Africa, growing at 7% per year due to urbanization and population growth (Arnold et al., 2006). Low electrictiy access (Sawe, 2014) and inadequate alternatives (GIZ, 2014). Charcoal production, use (including plastic burning), and transport produce emissions of aerosols and trace gases (FAO, 2017) that impact air quality, human health and climate (Marais and Wiedinmyer, 2016).

Here we develop a substantially improved representation of air pollutant emissions from the charcoal supply chain in Africa for 2014 and use the GEOS-Chem model to determine the impact on local air quality and global climate.

The charcoal supply chain

Activities and Emission Factors

- Amount of charcoal produced and used is from the United Nations Energy Statistics database.

Number of trucks obtained assuming each truck transports 15.8 tonnes of charcoal.

Our own estimate of plastic use in slums across Africa


Mapping Charcoal Production, Use, and Transport

- Production: mapped 5 to 15 km from primary roads (Campbell, 1996). We also account for vegetation distribution and protected areas.

- Consumption: Urban extent determined as lines in the OpenStreetMap residential road network with cell size = 1 mm and radius > 25 mm.

- Plastic burning limited to slums mapped to 2-15 km around the centre of the city based on Bird et al., 2017.

We estimate 208 Tg of fuelwood is used to produce charcoal in 2014. This is 24% of biomass consumed from open fires, the dominant source of pollution across Africa.

Charcoal Emissions of Dominant Air Pollutants

- Total annual air pollutant emissions are: 15 Tg CO, 41 Gg BC, 78 Gg OC, 78 Gg NOx, 1.8 Tg CH4, and 20 Mg HCl.

- Urbanisation is a strong predictor of trends in charcoal emissions. Urban population increases by 77% from 2014 to 2030, so charcoal will make an increasing contribution to air pollution in Africa without viable energy alternatives.

Ongoing Work
Embed the inventory in GEOS-Chem to estimate the impact of the charcoal supply chain in Africa in 2014 on local air quality and global climate.

References
FAO. 2017.