Human modification of the nitrogen cycle is one of the central global challenges affecting human health, ecosystem integrity and biodiversity. The planetary boundary for nitrogen has been breached by a factor two, making nitrogen one of the most urgent pressures on the earth system. Excess nitrogen originating from chemical fertilizers, animal manure and burning of fossil fuels, are increasingly affecting soil, water and air quality. In coastal and marine ecosystems, excess nitrogen levels cause eutrophication. An estimated 500 estuaries worldwide have turned into ‘dead zones’. Much of the terrestrial biodiversity is created as a result of limitations in nitrogen: organisms have adapted to the natural nitrogen poor environments in a wide variety of ways. Excess nitrogen levels will change species composition in favour of fewer species that can withstand or thrive in these circumstances. 40% of the protected areas in the world have exceeded critical levels of nitrogen above which there is a risk of biodiversity loss.

However, nitrogen also plays an important role in food security. The human creation of chemical nitrogen fertilizer has enabled the production of more food and a change to more protein rich diets. It has been estimated that without chemical nitrogen fertilizer, only 3 billion people would have enough food given current diets and agricultural practices. That’s less than half of the current global population.

In recognition of the urgent need to address this issue, WWF Netherlands has funded the Professorship of Integrated Nitrogen Studies within the Faculty of Earth and Life Sciences at VU University, Amsterdam; The Netherlands. The professorship is currently held by prof. dr. Jan Willem Erisman; the lead author on a WWF Science brief.

The science brief provides an in depth overview of the nitrogen challenge and also explores options to decrease the negative impacts of excess nitrogen on biodiversity and ecosystems, while at the same time providing food security to a growing world population. Potential solutions comprise increasing nitrogen use efficiency in agriculture, reducing waste in the food chain, promoting diets with less animal protein in developed countries and a shift from fossil fuels to renewable energy sources such as solar and wind energy.

Citation