# THE TRUE COST OF CONSUMPTION

## THE EU'S LAND FOOTPRINT

**FULL REPORT** | July 2016

Friends of the Earth Europe

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THE EU'S LAND FOOTPRINT

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Friends of the Earth Europe

# EXECUTIVE SUMMARY

**The European Union uses more than its fair share of global land. In 2010, the amount of land used to satisfy our consumption, solely of agricultural goods and services, amounted to 269 million hectares[1] – that's 43% more agricultural land than is available within the EU itself and an area almost the size of France and Italy used outside of our borders. The significant use of land outside of the EU is potentially linked with high environmental and social impacts. Stewardship over shared global land resources is crucial in order to safeguard natural areas and essential ecosystems, and to ensure equitable consumption of land amongst global citizens and within planetary boundaries.**

This report shows why the EU has a responsibility in putting efforts towards measuring, monitoring and reducing its global Land Footprint, and how this could be supported by using policy tools and other initiatives.

## CALCULATING THE LAND FOOTPRINT

The Land Footprint is an indicator used to measure the amount of land used both domestically and abroad to produce the goods and services consumed by a country or region. It is currently possible to calculate the Land Footprint for agricultural land only (cropland and grassland). The quality of results are affected by the underlying data, with footprint calculations for cropland being more reliable than for grassland. Further efforts are required to improve and build the databases for grassland, forested land, mining land, and built up areas.

## TRENDS LEADING TO HIGH DEMAND FOR LAND, PARTICULARLY OUTSIDE OF THE EU

Nearly three quarters of the EU Land Footprint is related to the consumption of animal products, pointing to a need to shift dietary consumption patterns. However, it is the surging demand for vegetable oils, especially for non-food purposes like bioenergy, which is of particular concern. Land is increasingly being used for this purpose in tropical regions in Southeast Asia and South America, contributing to increased pressure on natural ecosystems and local communities. Research also indicates a growing reliance on cropland outside of the EU.

## ENVIRONMENTAL AND SOCIAL IMPACTS RESULTING FROM LAND USE

Any use of land will have an impact. However, current approaches to global land use show us that the global agricultural frontier is moving beyond a safe threshold and the amount of land used by developed regions is unsustainable. As production and consumption systems become increasingly connected through international trade, the EU's Land Footprint points at growing environmental and social impacts outside of the EU – cropland expansion into natural land areas, land degradation, deforestation, biodiversity loss, land grabbing, unequal appropriation of land resources and more. Establishing the link between final consumption and environmental and social impacts by means of the Land Footprint is in the development stage, yet points to significant potential for the use of Land Footprint impact indicators in EU policy if given priority and investment.

## THE ROLE OF THE LAND FOOTPRINT APPROACH IN POLICY MAKING

The three cornerstones in achieving sustainable global land use are based on scale, impact and distribution. They include the need to: (1) reduce or halt further agricultural expansion into forest or other natural areas; (2) limit impacts related to production practices by monitoring a broad spectrum of qualitative impacts and ensuring production under conditions and practices that are environmentally and socially just; (3) support changes in consumption patterns that will help reduce the per-capita Land Footprint in developed countries, leading to more equitable land distribution and greater access to land and food in developing countries.

It is necessary to consider all three in any land-related policy or initiative in order to ensure sustainable global land use. It is clear that both the producing and consuming countries bear responsibility for environmental and social impacts related to land use in the country of production, and creating positive change requires efforts into international agreements as well as ethical approaches to reduce negative impacts by consuming countries.

Current land-related EU policies are only territorial in focus i.e. they deal with the management and impacts of domestic land use. **Due to the increasing dependence on land outside our borders, it is vital that EU policies take into account consumption-based tools and indicators, such as the Land Footprint, to measure, monitor and reduce the quantity and impacts of all global land used for EU consumption.**

# THE EXECUTIVE SUMMARY

CONTINUED

## BENEFITS OF IMPLEMENTING THE LAND FOOTPRINT APPROACH

1. Identifies land use impact hotspots in producing countries – the land footprint links the final product consumed with where it originated, enhancing the understanding of pressures emerging from consumption and production activities on land resources worldwide.
2. Aims at making land-related environmental and social impacts associated with EU consumption patterns spatially explicit – using environmental and social impact maps, such as for deforestation, water scarcity and land grabbing, the drivers behind trends in land use patterns outside of the EU lined with EU consumption can be better understood and actions taken to reduce these impacts.
3. Allows the calculation and monitoring of per-capita land consumption – monitoring the per-capita Land Footprint would increase awareness of high footprint consumption patterns and lifestyles, and encourage policy measures to support a shift towards more sustainable consumption and equitable global land use.

## RECOMMENDATIONS FOR POLICY MAKERS

1. Implement the measurement, monitoring and setting of Land Footprint reduction targets at EU and member state level.
2. Develop policies and incentives that encourage a reduction in the consumption of land intensive products or products that embody relatively high environmental impacts.
3. Extend global databases to strengthen underlying grassland and forestry data and develop databases for non-agricultural land uses.
4. Support further research into Land Footprint accounting methods and its potential linkage with spatially explicit environmental and social impacts.
5. Develop a monitoring framework that includes, from a life-cycle perspective, the core resource input categories of land, water and materials, plus the output category of greenhouse gas emissions.
6. Reduce the use of land resources outside of Europe for non-food purposes, in particular the phasing out of first-generation feedstock for EU bioenergy.
7. Promote a reduction of livestock farming in the EU and the growth of crop production for direct human consumption, e.g. protein crops such as beans, soy or lupins.
8. Implement land management measures within the EU, such as investment in the restoration of degraded land and soils.
9. Support citizen initiatives that encourage changes in consumption and resource use patterns, such as urban farming, repair cafes, and clothing and tool libraries.

# CONTENTS



*ANNEXES ARE AVAILABLE ONLINE AT WWW.FOEEUROPE.ORG/SITES/DEFAULT/FILES/RESOURCE_USE/2016/FOEE-LAND-FOOTPRINT-REPORT-ANNEXES-JULY2016.PDF

# 1. INTRODUCTION

## 1.1 GROWING COMPETITION OVER LAND AND GLOBAL IMPACTS OF LAND-USE

Be it the paper we write on, computers we type on, smartphones we use, the t-shirts and boots we wear, the water we drink, or our favourite food and the fork we eat it with – it all originates from some form of land. The Earth's natural land resources – biomass, fossil fuels, metals and minerals – form the basis of our material economy and are the main components of the goods and services we consume. Land also provides areas for building and infrastructure, for regulating ecosystem services, for a thriving plant and animal biodiversity, and is an important resource for rural households and development. Fertile land, including its fresh water resources, is vital for all life on earth and for a secure future for generations to come.

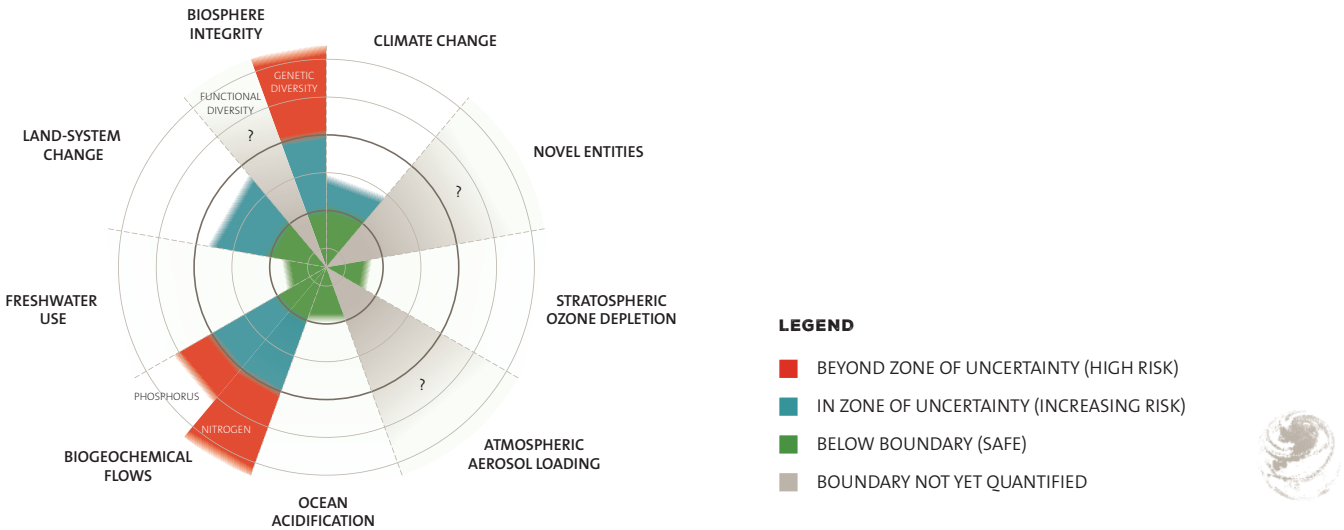
Over the past few decades, the scale and intensity of land use, trade in biomass products as well as competition for land resources worldwide have been increasing, largely because of rising resource demand from growing populations and economies, concerns about energy scarcities, and overconsumption by western economies.[2] Land in developing regions, often with lower labour and environmental protections and health and safety standards, increasingly attracts financial and strategic investors, raising questions about land management practices and impacts on local people and the environment.[3] The increasing competition for land resources is reflected in the growing number of disputes over land for food, fuel, minerals and nature conservation.[4] In several East-African countries, for example, unclear land rights lead to large scale mining and agricultural investments, resulting in large numbers of subsistence farmers left landless.[5]

The European Union is a key player in international land acquisitions and thus a major contributor to the global trend towards land concentration in the hands of fewer but larger land owners and the dispossession of small-scale and subsistence farmers.[6] The EU was estimated to account for 40% of all land acquisitions in sub-Saharan Africa in 2011.[7] Beyond high EU consumption of animal products, the use of global land is increasingly influenced by growing EU demand for non-food resources, shaped by national and EU policies and sector or supply chain initiatives, in particular for biofuel.[8]

## 1.2 PRESSURES ON GLOBAL LAND – CROSSING PLANETARY BOUNDARIES

The use of land in any way has a direct impact on the functioning of local ecosystems, such as forests, lakes, or grasslands. Under natural circumstances, organisms that live, grow, reproduce, and interact within ecosystems help to mediate local, regional and global flows and cycles of energy and materials. These flows and cycles which interact at the global level, form the 'Earth system'. As a result of human influences, the Earth system is currently showing rapid changes.

FIGURE 1.1 | CURRENT RISK STATUS OF THE NINE PLANETARY BOUNDARIES




SOURCE: STEFFEN ET AL. 2015 - BASED ON ROCKSTRÖM ET AL. 2009

Researchers recently identified nine planetary boundaries which, if crossed, put humanity at high risk from uncontrolled changes in the Earth system (Figure 1.1). Six of these nine boundaries relate to land: land-system change (e.g. deforestation), freshwater use, biogeochemical flows (i.e. nitrogen and phosphorous pollution), biosphere integrity (e.g. biodiversity loss), ocean acidification, and (in connection with other planetary boundaries) climate change.[9]

Land-system change, in particular the conversion from forest to agriculture, has crossed the safe operating space and entered the zone of increasing risks (from green ('safe') to blue (zone of uncertainty) in Figure 1.1). Land use intensification is applied as the main strategy to temper pressures towards this planetary boundary. However, land intensification is also the main driver of the disturbance in biogeochemical flows (phosphorous and nitrogen application in agriculture) and on the reduction of biodiversity (biosphere integrity), both of which have gone beyond the zone of uncertainty and entered the zone of high risks for humanity (orange in the figure).[10] We therefore see challenges to work holistically between Earth systems to ensure the production of food, fuel and fibres from land resources does not place excessive pressures on ecosystems and other planetary boundaries.[11]

## 1.3 LAND FOOTPRINT AND EU POLICY

You cannot manage what you don't measure. But how do we measure the EU's land use? Current EU land policies focus on issues within its borders, such as the protection of vulnerable land areas, or maximum fertilisation rates for agricultural land.[12] However, goods and services for European consumption are increasingly being produced on land beyond the EU's borders[13], driving both land use change and land-related environmental and social impacts.[14] It is vital this is taken into account in policy decisions.

The 'Land Footprint' is a consumption-based indicator that measures the total amount of land used domestically and abroad to produce the goods and services consumed by a country or region. It allows us to quantify the extent to which the EU is dependent on non-EU land and can be a vital tool to ensure the protection of this precious resource and its sustainable use in the future.

Policies to support sustainable land use require a commitment from governments worldwide. The three cornerstones to achieving sustainable global land use are based on scale, impact and distribution – they include the need to: (1) reduce or halt further agricultural expansion into forest or other natural areas; (2) limit impacts related to production practices by monitoring a broad spectrum of qualitative impacts and ensuring production under conditions and practices that are environmentally and socially just; (3) support changes in consumption patterns that will help reduce the per-capita Land Footprint in developed countries, leading to more equitable land distribution and greater access to land and food in developing countries.

Thus, quantifying the extent of EU land use is vital in order to return to a safe operating space and ensure sustainable land use. **Yet strikingly, the EU does not measure Europe's Land Footprint, and so has limited knowledge of the amount of land the EU uses globally, and the related environmental, social and economic impacts**. As a result, combined action is not being taken to reduce risks to the global land system.[15] Measuring Europe's Land Footprint can fill this gap and provide the necessary information for policy making.

Despite a lack of implementation and action, there have been numerous assertions at the EU level that our global land consumption does need to be addressed. For example, in the European Commission's Roadmap to a Resource Efficient Europe[16], the European Resource Efficiency Platform's Manifesto[17] and the European Parliament's Own-Initiative Report on Resource Efficiency.[18] Furthermore, a 2014 study for the European Commission includes a broad assessment of the global impacts of the EU's land use, providing a basis for potential targets to drive more sustainable use of land, within the EU, as well as beyond its borders.[19] The European Commission is also currently discussing a long awaited "Land as a Resource" Communication. Yet EU action needs to come quicker to address and prioritise the EU Land Footprint and global impacts of EU land use.

Previous studies commissioned by Friends of the Earth Europe between 2011 and 2014 show Europe's land import dependency and hidden impacts, highlighting the urgency in addressing this issue.[20]

## 1.4 STRUCTURE, METHODOLOGY AND TERMS

This report will explore the EU Land Footprint as a tool for the development of policies and initiatives to support a sustainable approach to global land use.

Chapters 2, 3 and 4 explain how the Land Footprint is measured and how it can be used. Chapters 5 and 6 focus on policymaking and recommendations for the EU. Annexes (English only) are available online at www.foeeurope.org/sites/default/files/resource_use/2016/foee-land-footprint-report-annexes-july2016.pdf.

Because of the limited data available, this report focuses on agricultural land use for food and non-food products. Other important activities that impact on land use – such as forestry, industry, or housing and infrastructure expansion – are currently difficult to calculate due to a lack of standardised data. **It is important to note therefore that the true Land Footprints are likely to be larger than those presented in this report**.

Thus, Land Footprint figures throughout this report refer to the overall **agricultural** Land Footprint, noted as 'LF', consisting of both the cropland and grassland footprints.

# 2. WHAT IS THE LAND FOOTPRINT?

## 2.1 THE LAND FOOTPRINT AND GLOBAL LAND FLOW ACCOUNTING

The Land Footprint is a means of measuring the total area of land required to produce the goods and services consumed by a country or region.

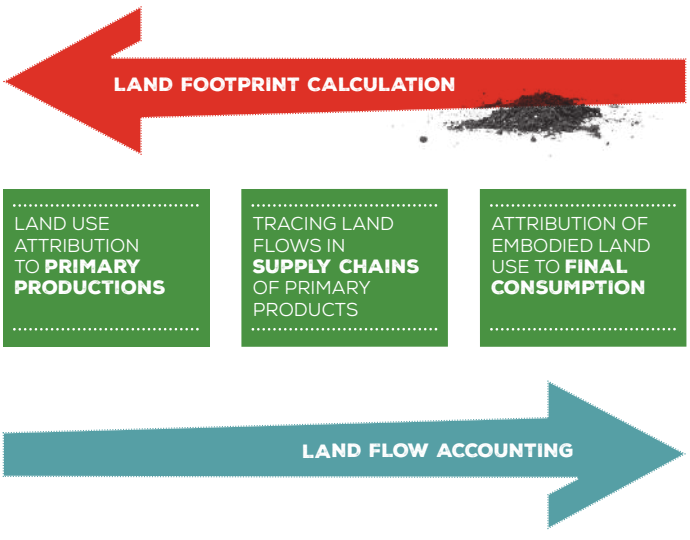
To be able to calculate this, it is necessary to track land use through supply chains from the original point of raw material production, through to final consumption. This process is called 'land flow accounting'. Figure 2.1 illustrates the Land Footprint methodology, based on a land flow accounting approach.

Land flow accounting follows two steps:[21]

1. Land use is attributed to different commodities (e.g. soy, wheat, cotton) in their country of origin. For agricultural products, this is the area of land used for the production and harvest of food, feed and fibre crops, as well as for grazing livestock and is referred to as embodied land.
2. Embodied land is tracked along global supply chains through to the end-products and services. This is normally done using data on the monetary values of trade flows between different (international) trade partners. (See more under economic accounting below.)

Once the global land flow accounting system is available, it is possible to calculate the Land Footprint of a specific region or country related to the consumption of end-products.

FIGURE **2.1** | ILLUSTRATION OF THE LAND FOOTPRINT METHODOLOGY




## 2.2 ACCOUNTING PRINCIPLES FOR THE LAND FOOTPRINT

There are several different environmental accounting methods that can be used to calculate the Land Footprint, including economic accounting, biophysical accounting and hybrid accounting. An important difference between the first two is whether products (and their embodied land flows) are tracked along their supply chains in terms of monetary values, i.e. economic accounting, or in terms of physical quantities, i.e. biophysical accounting.

In an economic accounting approach, the available land resources in a specific country or region are allocated to products on the basis of the monetary value of the traded goods. For example, if 100 hectares of soy are harvested and crushed in a specific country, both the meal and the oil portions required (the same) 100 hectares of arable land to be grown on. In order to allocate a proportional share of the land area to product flows for both the meal and oil, the required land area can be allocated on the basis of the monetary value of the respective product flows, resulting in e.g. 60 hectares embodied in meal and 40 hectares in oil if the meal is worth more in economic terms. This means that the amount of land can be tracked from the value of the primary product (soy) through to multiple final products, which may be consumed anywhere in the world. Global value chains can be traced through industrial or sectoral linkages in a consistent, global framework of national accounts, known as multi-regional input-output tables.[22]

In contrast, biophysical accounting uses a framework based on analysis of material flows across the economy, with data on production, trade and use for agricultural and forestry commodities tracked in physical units, mostly tonnes, and converted into equivalent land areas on the basis of yields or other productivity ratios (usually tonnes per hectare).[23] Using this approach in the example above, embodied land in soybean meal could amount to 75 hectares and the remaining 25 hectares in oil, differing from the embodied land areas on the basis of monetary value. The UN Food and Agriculture Organisation (FAO) compiles agricultural production data, trade statistics and commodity balances which provide fairly detailed and comprehensive national data to allow biophysical accounting for most land-intensive sectors.

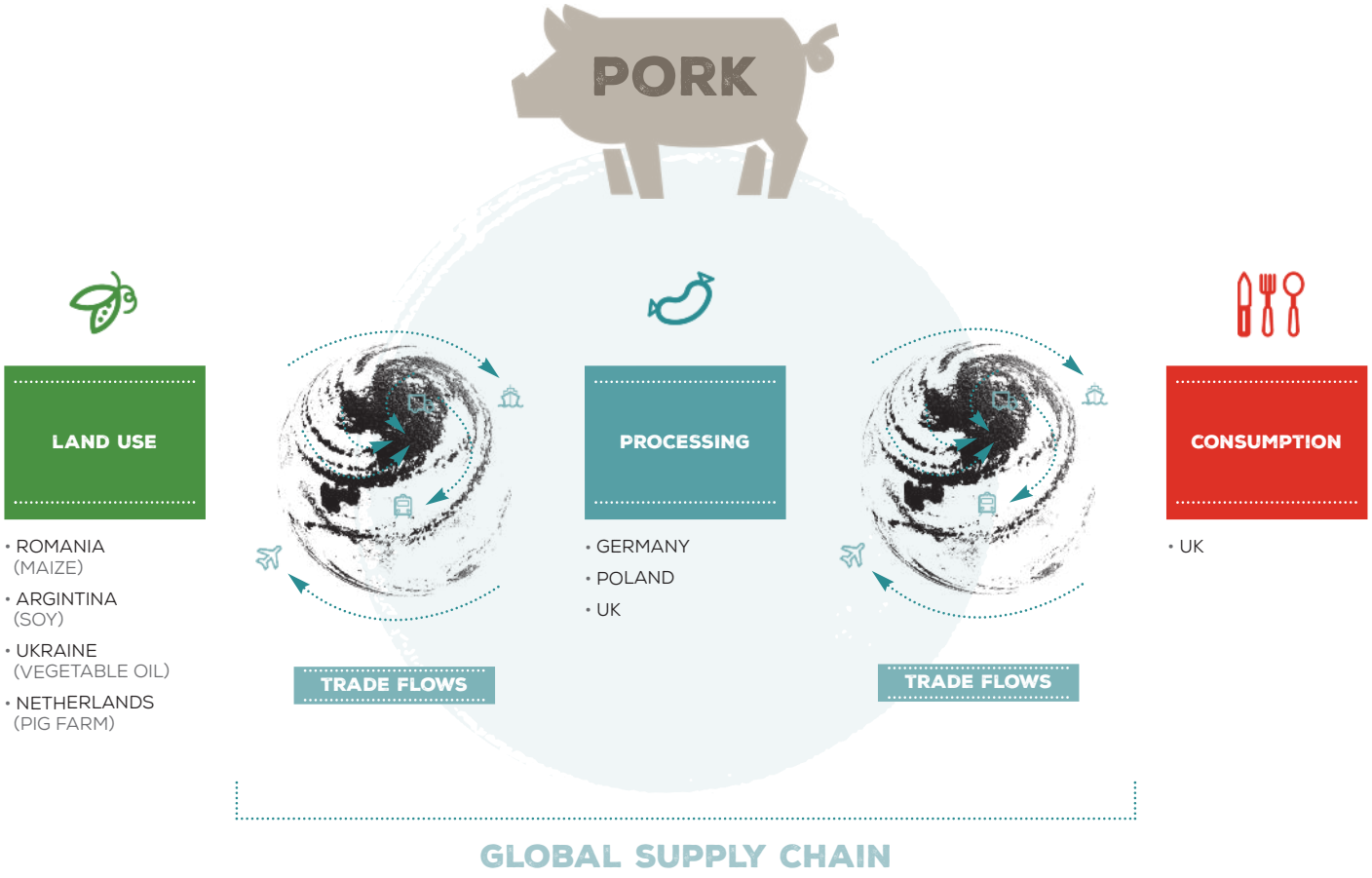
Hybrid accounting methods combine the supply chain distinction of economic approaches with the product detail available from biophysical approaches. As such, they are likely to become a more important way to measure Land Footprint, given the increasing complexity of the structure of global supply chains. For example, the German government is currently supporting a Land Footprint project with a hybrid approach showing that a quarter of Germany's Cropland Footprint comes from non-food product.[24]

Figure 2.2 illustrates how land is embodied through (international) supply chains towards final consumption. For example, when the Land Footprint of a piece of pork consumed in the United Kingdom is measured, it may begin with maize harvested from Romania, soy from Argentina and vegetable oil from the Ukraine, all being supplied to a commodity trader in Poland. This trader sells the commodities to a feed manufacturer in Germany, who then sells the feed to a pig farmer in The Netherlands, who supplies the pig to a German slaughterhouse, who sells the meat to a UK retailer where it, finally, is purchased and consumed by a UK consumer. The Land Footprint of that piece of pork includes the land area used in Romania, Argentina and Ukraine. Any of the three above accounting methods can be used to measure the Land Footprint.

In general, a biophysical approach is preferred in less complex supply chains, e.g. for unprocessed whole foods, and hybrid methods are likely to give the most accurate result for the actual land areas embodied in further processed products of complex supply chain networks.[25]

**The EU Cropland Footprint can be measured with high reliability for all above accounting approaches (see Annex 1), largely thanks to robust data from the UN FAO, and thus can be used to monitor the connections across the globe between consumption and production of both food and non-food agricultural products. It can provide useful information to stakeholders and potentially help reduce the scale and impacts of EU land use in vulnerable hotspots worldwide.**

FIGURE **2.2** | GLOBAL TRADE FLOWS OF EMBODIED LAND FROM PRIMARY PRODUCTION TOWARDS FINAL CONSUMPTION EG. PORK



# 3.
# THE EU LAND FOOTPRINT

FIGURE **3.1** | THE EU LAND FOOTPRINT

## 3.1 THE EU LAND FOOTPRINT FROM A GLOBAL PERSPECTIVE

Based on calculations with the International Institute for Applied Systems Analysis (IIASA) LANDFLOW model (using a hybrid approach), it is estimated that the EU's global Land Footprint of agricultural products amounted to 269 million hectares in 2010 – 43% more than the total agricultural land available within the EU.[26] This means that over one-third (40%) of the total area of land we use to grow agricultural products falls outside of the EU – equivalent to an area of land almost the size of France and Italy. This needs to be drastically reduced in order to ensure sustainable and equitable global land use.

The IIASA's calculations also show that the majority of the EU's global Land Footprint relates to cropland (56% of the total, or 151 million hectares), of which 36% (55 million hectares) is located outside of the EU. Of the remaining Grassland Footprint (which totals 118 million ha), 43% (51 million hectares) falls outside of the EU. This includes large areas of low yielding grazing lands which are embodied in non-food products (such as leather). However, the data for these calculations are considered less robust and should be interpreted with caution.

Figure 3.3 shows the distribution of the EU's Land Footprint globally. South East Asia, Latin America and Sub Saharan Africa are the most important suppliers of cropland, yet they are also regions with large areas of tropical forests and are rich in biodiversity, but where social and environmental conditions are less stringently governed than in the EU.[27]

In total, these tropical regions account for around 60% of the non-EU land used to supply crops for the EU.[28] Many of these tropical regions are forested areas and rich in biodiversity. This figure reveals the potential impacts EU consumption may be having on levels of deforestation and biodiversity loss, as well as related land conflicts. We will go into more detail on impacts of EU land use in chapter 4.

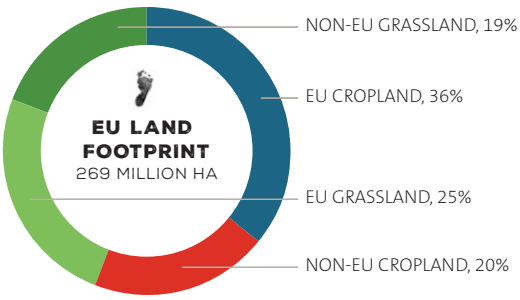
EU demand for grassland is primarily satisfied by Latin America, with large areas of grassland embodied in both food (mainly beef) and non-food products.

## 3.2 THE EU LAND FOOTPRINT BY PRODUCT TYPE

More than 70% of the EU's Land Footprint in 2010 related to the consumption of animal products, both for food and non-food purposes. With 30% of agricultural land and 27% of cropland resources, meat products – including beef, lamb, pork and chicken – embody the largest share of the EU's Land Footprint. Dairy accounts for 25% of the EU's Cropland Footprint, largely embodied in cheese. 18% of the EU's global Land Footprint relates to non-food animal products, such as leather.

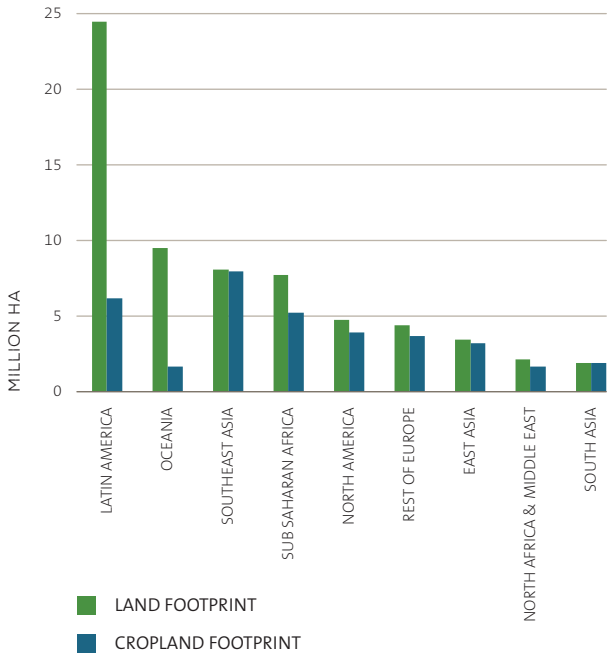
Among plant-based products, vegetable oils (food and non-food) have the largest Land Footprint, accounting for 14% of the EU's Cropland Footprint. The share of vegetable oils used for non-food uses is increasing. Supply chain analysis shows that biodiesel consumption in the EU is linked to large areas of land that is used

FIGURE **3.2** A CALCULATION OF THE EU LAND FOOTPRINT WITH A HYBRID APPROACH IN 2010




SOURCE: FISCHER ET AL. FORTHCOMING

FIGURE **3.3** NON-EU PRODUCTION AREAS IN RESPECT TO THE EU LAND FOOTPRINT AND CROPLAND FOOTPRINT




SOURCE: FISCHER ET AL. FORTHCOMING

## THE EU LAND FOOTPRINT

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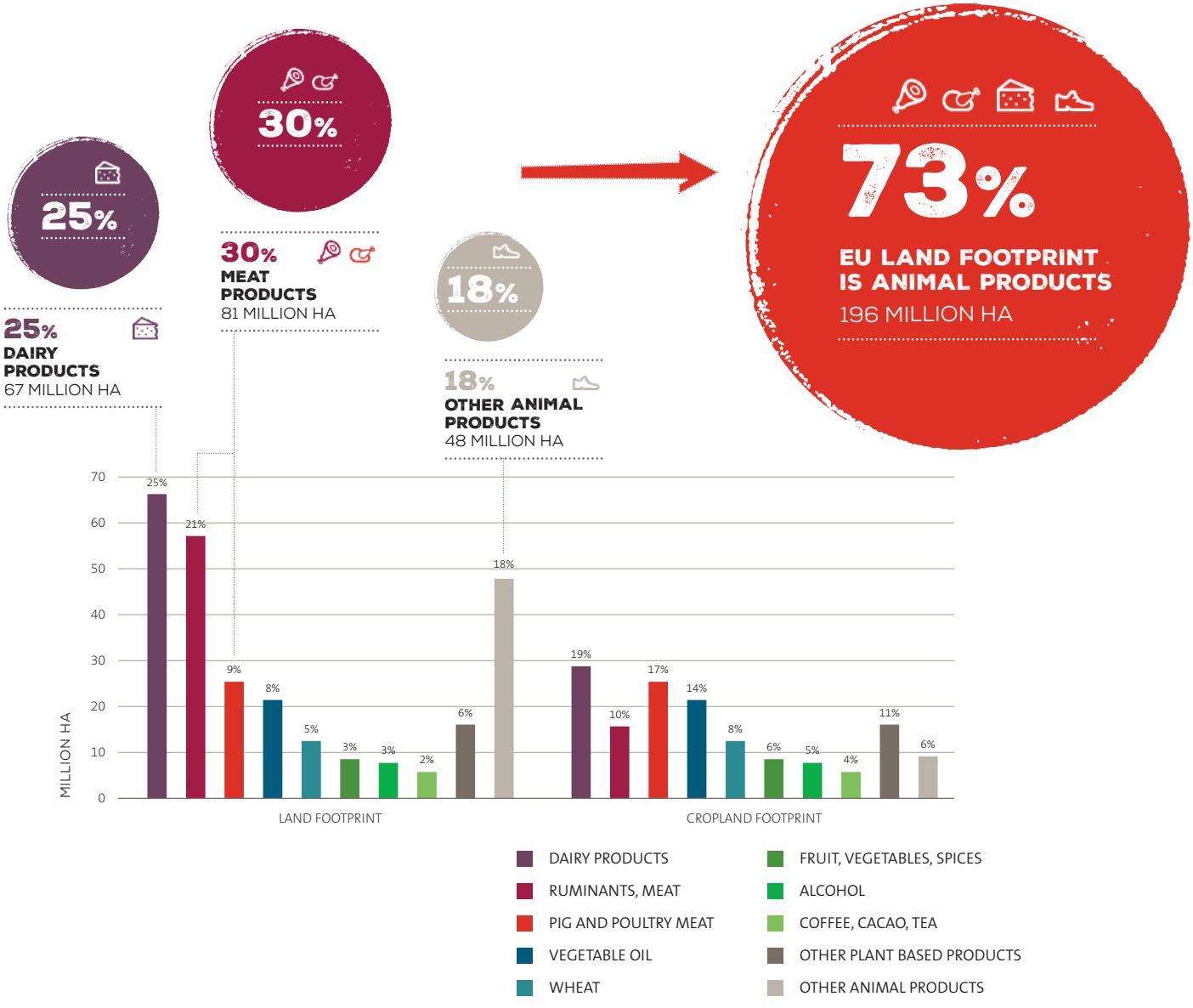
for palm oil and soy production, which are either imported as a feedstock for biodiesel or as final product.[29]

Wheat accounts for the largest share of the EU's cropland requirements for plant-based food products, accounting for 8% of the Cropland Footprint. Wheat is mainly grown within the EU. Fruit and vegetables account for just 6% of the EU cropland requirements, while alcohol (mainly beer and wine), coffee, cocoa and tea together account for 9% of the Cropland Footprint. Non-food products such as leather, textiles and porcelain were also found to have significant Land Footprints, requiring both crop and grassland.

FIGURE **3.4** | EU TOTAL LAND FOOTPRINT BY PRODUCT TYPE IN 2010




SOURCE: FISCHER ET AL. FORTHCOMING

A study commissioned by Friends of the Earth England, Wales and Northern Ireland in 2015 analysed the Land Footprint of everyday products including a cotton t-shirt, a smartphone, a cup of tea, a cup of coffee, a chicken curry ready meal, a pair of leather boots, and a chocolate bar.[30]

A detailed matrix linking EU consumption of different final products with the geographic areas of production is given in Annex 4.

## 3.3 THE EU LAND FOOTPRINT OVER TIME

### 3.3.1 The Land Footprint by type of land use

In this section, we will look at how the EU Land Footprint has changed between 1995 and 2010. Figure 3.4 shows the area used as cropland (mainly used for plant-based food products), and the area used for pasture for grazing of livestock. For the EU, total agricultural land use remained more or less stable until 2005, with a slight increase in 2006/07.

This relatively stable footprint reflects low population growth in the EU, combined with continuing productivity increases in both arable and livestock production (however, as noted in chapter 1, these productivity increases come with a price to pay in terms of environmental impacts and planetary boundaries). The Grassland Footprint appears to be shrinking, which is likely to be a result of the trend towards more intensive animal husbandry systems where animals are fed on proportionally more cropland products.

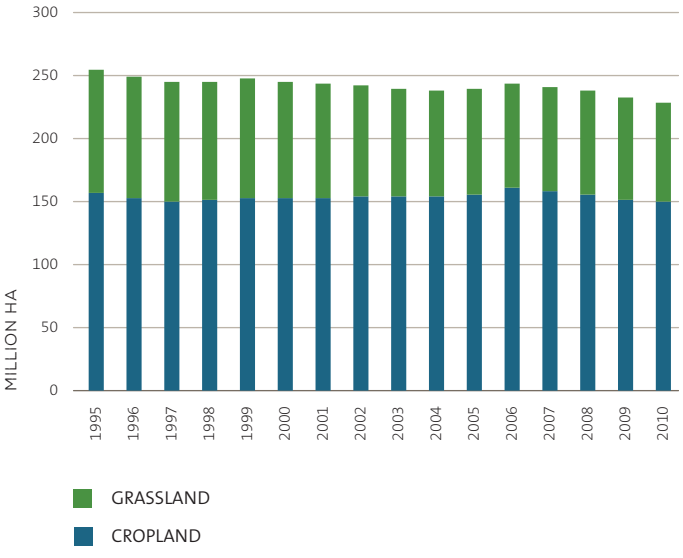
### 3.3.2 The Land Footprint according to country of origin

Figure 3.6 shows the geographical origin of global cropland embodied in EU products and services from 1990 to 2009 – highlighting how the EU has become increasingly dependent on land from outside its borders. It shows that while the EU's global Cropland Footprint has been relatively stable, the amount of land used within the EU is shrinking, as land resources are replaced with land outside the EU.

This high and growing reliance on land outside of the EU is likely to be related to the EU's demand for year-round supplies of seasonal products, high consumption of products grown outside of Europe such as coffee and chocolate, imported animal feed for raising animals, and surging demand for vegetable oils.

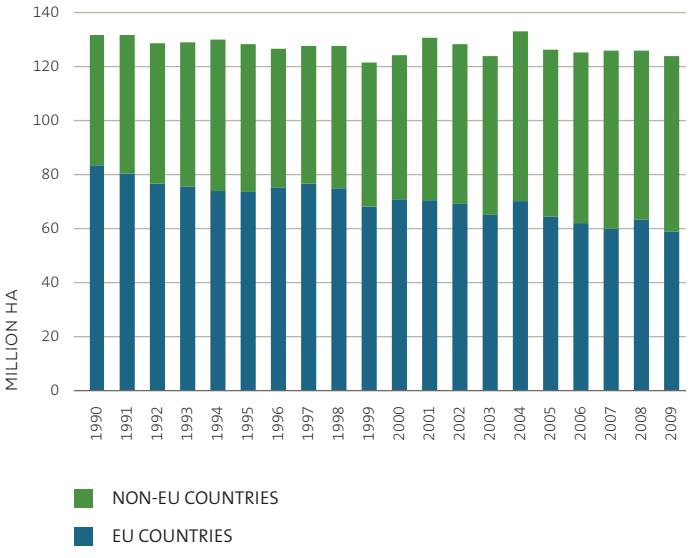
Focusing in on vegetable oils, this growing demand is complex; vegetable oils have a wide and varying range of uses, including in processed food products, in animal feed, and for biofuels. Demand for biofuel is of particular concern in terms of land use in tropical regions in South East Asia and South America which is associated with significant social impacts on local communities (see Case Study 2) and environmental impacts, including forest loss.[31]

FIGURE **3.5** THE EU LAND FOOTPRINT OVER TIME BY TYPE OF AGRICULTURAL LAND




SOURCE: FISCHER ET AL. FORTHCOMING

FIGURE **3.6** EU CROPLAND FOOTPRINT OVER TIME ACCORDING TO LOCATION OF LAND RESOURCES




SOURCE: KASTNER ET AL. 2012

# THE EU LAND FOOTPRINT

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## 3.4 THE EU CROPLAND FOOTPRINT COMPARED TO OTHER REGIONS

Comparing Land Footprints on a per-capita basis between countries and regions shows where an average citizen consumes more than their 'fair share' of the globally available land resource. The EU's per capita Cropland Footprint falls in the middle range of global consumption patterns, at 0.31 hectares, but this is far more than the current global average of 0.22 hectares per capita. Most developed regions have disproportionately large footprints.[32]

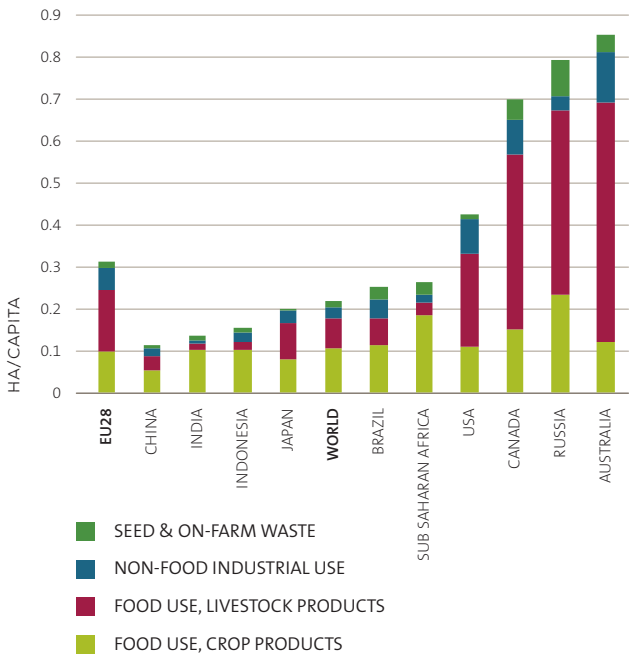
Large Land Footprints generally correlate with higher consumption levels of land-intensive products such as animal proteins, but also areas with large fallow land areas and lower yields, linked to climate characteristics (e.g. countries like Australia, Canada and Russia are large with extreme climates, thus greater land areas are required to produce similar yields to those countries with more suitable climates). This shows the difficulties in comparing Land Footprint between countries as differences not only relate to consumption patterns, but also to natural and climatic circumstances.

There are also significant differences between citizens from different countries within the EU, and furthermore between citizens within each country. As of yet, the available data is not specific enough to analyse these differences, but on a broad level, the regional Land Footprint is a good indicator of how the EU compares to other global regions in its land consumption.

In order to make useful comparisons and conclusions of land use on a per-capita basis, the Land Footprint needs to be calculated using weighted land areas, i.e. based on the global average yield per hectare.[33] This is because grass yields, for example, differ with a factor up to >200 between high yielding grasslands and degraded areas (which is the reason why Figure 3.6 excludes grassland areas).

Using the global average yield per hectare, what could a sustainable level of global per-capita cropland use be? In order to keep within a safe operating space, calculations suggest we can use 15% of the Earth's land availability for cropland,[34] which would amount to approximately 0.28 hectare of cropland per capita with current population. Allowing for the future growth in population, the calculations suggest a global average per-capita Cropland Footprint of approximately 0.2 ha. This would mean a drastic shift in domestic consumption patterns in developed regions such as the EU.

FIGURE **3.7** CROPLAND FOOTPRINTS PER CAPITA, YEAR 2010, SHOWING THE EU, SELECTED COUNTRIES AND GLOBAL AVERAGE




SOURCE: FISCHER ET AL. FORTHCOMING

# 4. MEASURING ENVIRONMENTAL AND SOCIAL IMPACTS WITH A LAND FOOTPRINT APPROACH

**As an increasing amount of consumed goods and services are produced and distributed through international trade flows, the environmental and social impacts of EU consumption increasingly fall beyond EU borders. Environmental impacts can include deforestation, biodiversity loss and climate change, while social impacts can range from food scarcity to land grabs and the loss of fertile land. This chapter explores the range of these impacts and their potential to be accounted for using the Land Footprint approach.**

## 4.1 HOTSPOTS: REGIONS WHERE LAND USE HAS THE HIGHEST IMPACTS

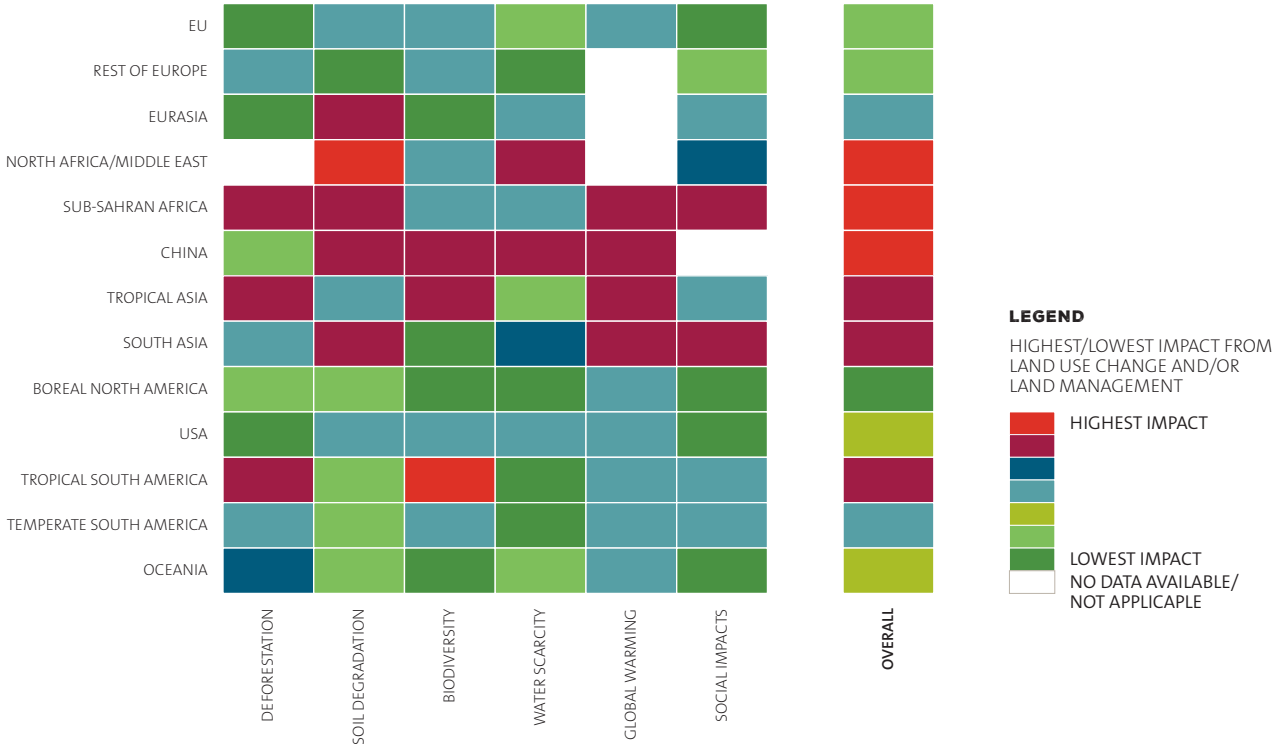
If solely communicating the quantity of land used, the environmental and social impacts from that use of land are not apparent. For example, agricultural land that is managed intensively using fertilisers, crop protection and various modern agricultural technologies may use less hectares of land to produce the same crop yield as extensive production, yet at the same time, intensification may also be associated with losses of organic matter from soil, reduction in water retention capacity, destruction of nutrient cycles and increase of greenhouse gas emissions[35]. It is vital to account for these impacts and recognise how they relate to land use.

The ideal way to measure environmental and social impacts of land use would be to have global databases that capture the different types of impacts at their exact locations (spatially explicit environmental impacts) – how much biodiversity loss on that piece of land? How much deforestation in that region? How many land conflicts with local farmers? No such specific databases are available yet, although government and research bodies are proceeding in these areas (see Annex 3).

Currently, we can roughly indicate the environmental and social impacts of land use in different regions using themed geographical impact maps, such as those showing global land degradation.[36] Figure 4.1 shows a matrix combining different environmental and social impacts related to land use, revealing that land use patterns within Europe have a relatively low impact, but land use outside of Europe has higher impacts, particularly in Africa, the Middle East, China and tropical regions of South America and Asia. This is partly related to climatic conditions and partly due to the fact that in many developing countries, natural land areas are being converted to agricultural land at a higher rate than in developed regions, where land use has mostly stabilised and, in general, better land management practices are applied.

FIGURE **4.1** | INDICATIVE ENVIRONMENTAL IMPACTS PER REGION

OWN COMPILATION BASED ON PUBLICLY AVAILABLE SPATIAL IMPACT MAPS PER ENVIRONMENTAL THEME[37]



# MEASURING ENVIRONMENTAL AND SOCIAL IMPACTS WITH A LAND FOOTPRINT APPROACH

CONTINUED

From an environmental impact perspective, deforestation, biodiversity losses and land-related greenhouse gas emissions are most severe in tropical regions, whereas soil degradation most strongly correlates with highly populated developing regions. Water scarcity is a key threat to food security in North Africa, the Middle East and Asia.

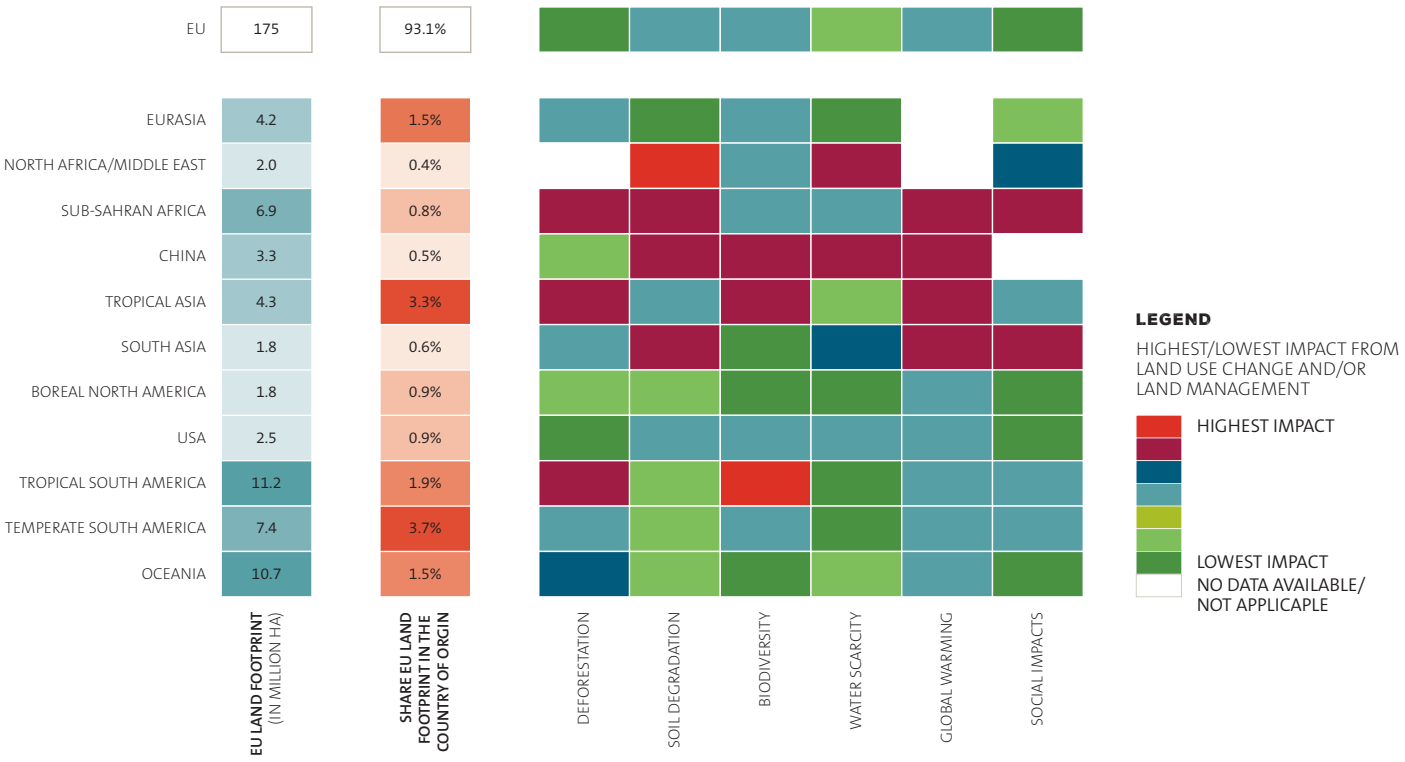
From a social impact perspective, land struggles, issues with food security and labour conditions are most severe in Africa, the Middle East and parts of Asia, and are likely to be linked to political and economic developments.

It should be emphasised that the impacts shown in Figure 4.1 are examined from an aggregate, global perspective, but that specific local impacts may be significant, e.g. droughts in Spain or water pollution related to highly intensive cotton production systems in southern India.

## 4.2 USING THE LAND FOOTPRINT TO LINK CONSUMPTION WITH ENVIRONMENTAL AND SOCIAL IMPACTS

Linking final consumption with land-related environmental and social impacts using the Land Footprint approach has great potential. It would enable calculation of, for example, the number of hectares of forest cleared in Brazil for EU beef consumption, the number of species lost in Indonesia due to increases in biodiesel use in the EU, or water scarcities in Mediterranean countries due to EU imports of fruit and vegetables grown there using irrigation. Establishing these links between final consumption and the environmental impacts is still in the early stages of development, with different methodologies being explored. Below, we will introduce the two main approaches, with more details covered in Annex 2.

FIGURE **4.2** | INDICATIVE IMPACT MATRIX CONTRASTED BY THE EU LAND FOOTPRINT



### 4.2.1 A 'simple' matrix approach

A simple matrix approach allows links to be made between impact data in the country or region of production, e.g. deforested areas in Sub-Saharan Africa and the EU Land Footprint in that region (see Figure 4.2). Thus, we can see the different impact levels in different regions in relation to the quantity of land the EU uses in that region.

For example, it can be seen that the region where the EU uses most land outside of the EU is in tropical South America (mainly Brazil), and can be linked to high levels of deforestation and biodiversity losses (albeit the amount of land being used is a relatively low share – 1.9% – of the regions' total land area). In tropical Asia, the EU uses 3.3% of available land resources and almost all environmental and social impacts are high. The final allocation of environmental impacts to EU consumption and/or production will thus be based on the EU's share in total land use or total land use change in the country or origin.

The 'simple' Land Footprint impact matrix approach is most useful for broader impacts, such as deforestation, biodiversity loss and global warming. More specific impacts, such as nutrient pollution, need a different approach. This approach is very useful as a first proxy to assess the consequences of EU consumption and policies related to land used, especially outside the EU.

### 4.2.2 Advanced footprint approach

The 'advanced' footprint approach can be used to link final consumption with land-related environmental and/or social impacts. Compared to the previously described simple approach, the allocation of environmental and social impacts is based on linking EU consumption with spatially explicit environmental and social data through international supply chains. It requires the development and maintenance of environmental databases in the country of origin that can be linked to the spatially explicit Land Footprint in that specific country.

For example, high resolution maps can be used to locate exactly where pesticides have leaked into a water supply, or where soil damage has led to carbon losses. Global maps showing impacts can be overlaid with detailed grid-cell based production information, illustrating where specific crops or forest products are produced. By overlaying the environmental impact and the production map, a link between impact and product can be established, allowing data on impacts to be linked to land flow accounting models. By taking information from ports and other logistic systems into account, intermediary or final goods can be traced from the country of origin through international supply chains to the final consumer in Europe.

### 4.2.3 Limitations with allocating environmental and social impacts to final consumers

Developing databases with high quality land use maps and detailed environmental information requires time, investment and knowledge. Annex 3 gives a comprehensive overview of the status of the database development per impact theme.

The causality between consumption and impact is not always clear cut. Just because the EU uses X% of the total land used in region Y, it does not necessarily mean that the EU is responsible for X% of the impacts caused there. For example, the links between land-related impacts due to deforestation for a soy plantation are complex and depend on a number of factors such as forest management, natural hazards, urban expansion, illegal logging and other 'unexplained' factors, meaning the end consumption of a product containing this soy cannot be linked as the sole driver of the land-related impacts.

For some land-related impacts, it may be more effective to manage them at local government level in the country of production. The EU can support these processes by stimulating more responsible land use in producer countries (further discussed in Chapter 5). However, it is clear that both the producing and consuming countries bear responsibility for environmental and social impacts related to land use, and creating positive change requires efforts into international agreements and ethical approaches to impact reduction by the consuming country or region.

# MEASURING ENVIRONMENTAL AND SOCIAL IMPACTS WITH A LAND FOOTPRINT APPROACH

CONTINUED

## 4.3 CASE STUDY I: MODELLING LAND-RELATED GREENHOUSE GAS EMISSIONS WITH A LAND FOOTPRINT APPROACH SOURCE: WU VIENNA

**EU consumption and global land-related greenhouse gas emissions** Land plays a dual role in climate change. In terms of greenhouse gas (GHG) emissions from land use in the EU, the EU is a net remover of atmospheric carbon, as its emissions related to land use and land use change are more than compensated for by carbon sequestration in its forests and grassland areas. In terms of GHG emissions from land use related to EU consumption, however, EU citizens:

1. Use more land resources than are available in the EU, causing land-related GHG emissions in other regions.
2. Consume a growing share of cropland outside of the EU, leading to GHG emissions related to land use change (e.g. deforestation).
3. Require an increasing volume of wood resources to be used in particular for bioenergy, resulting in a reduction in the carbon storage capacity of forests.

EU consumption can therefore be associated with higher global GHG emissions than would be generated by agricultural land use within the EU. But how can global GHG emissions related to EU consumption be measured?

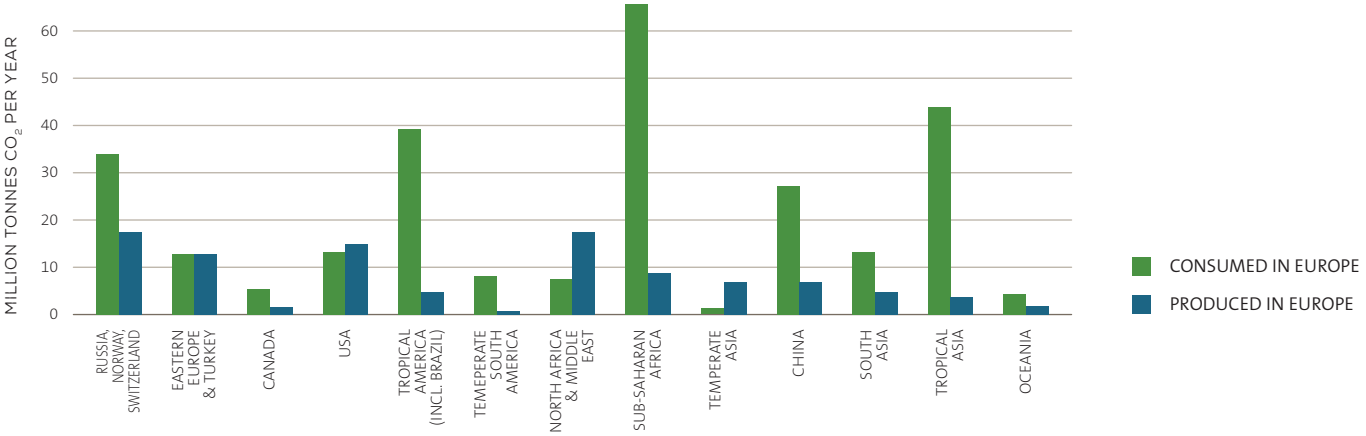
**Calculating land-related GHG emissions with a Land Footprint approach** A Land Footprint-based methodology has been developed to model land-related $CO_2$ emissions associated with the production of [agricultural] goods destined for final consumption in the EU as part of a study for the European Commission.[38] In order to be able to estimate current and future land-related emissions, the links had to be made between EU consumption patterns and producer countries for the base year (2007) and then modelled for 2030, on the basis of projected consumption patterns.[39] This allowed GHG emissions to be calculated from the changes in land use related to shifts in EU consumption and, hence, to embody these land-related GHG emissions in the EU's global Land footprint.

**Results** The results showed that global land-related carbon and methane emissions from EU consumption in 2007 were about a third higher than land-related emissions from within the EU alone. Land-related carbon emissions from EU consumption largely occurred outside of the EU, with most emissions strongly linked to imports of harvested wood (affecting the carbon stock in the forests) and to deforestation embodied in both imported agricultural and forestry products. Figure 4.3 shows the land-related $CO_2$ emissions embodied in EU exports (in blue, mainly to North Africa and the Middle East, Russia and America) and related to EU consumption (in red), i.e. the consumption Land Footprint. Consumption-related emissions were 39% higher than production-related $CO_2$ emissions and were mainly imported from Sub-Saharan Africa, tropical Asia, tropical America, Russia and China.

**Recommendations** This research shows that there is a need for an integrated policy framework to reduce land-related GHG emissions and associated climate change. Land use related climate change mitigation is currently addressed in several production oriented policies at various levels but, as shown above, a consumption based approach is necessary to gain insight and help control EU-driven GHG emissions related to its global land use. The Land Footprint proves to be a promising tool and indicator to help achieving policy goals in the field of climate change mitigation.

FIGURE **4.3** $CO_2$ EMISSIONS EMBODIED IN EXPORTS (TERRESTRIAL PRODUCTION PERSPECTIVE) AND EMBODIED IN IMPORTS (CONSUMPTION PERSPECTIVE) FOR THE EU IN A 'BUSINESS AS USUAL' SCENARIO IN 2030.

THE RESULTS EXCLUDE LAND-RELATED EMISSIONS OF $N_2O$ AND $CH_4$




SOURCE: BRUCKNER ET AL. 2014

## **4.4** CASE STUDY II: THE SOCIAL AND ENVIRONMENTAL IMPACTS OF THE EU'S BIOENERGY DEMAND IN INDONESIA

SOURCE: FRIENDS OF THE EARTH EUROPE

EU biofuel policies are driving huge growth in palm oil plantations across tropical regions in developing countries, in particular Indonesia and Malaysia. While these impacts remain challenging to relate specifically to EU consumption using the Land Footprint approach, investigating the local environmental and social impacts presented below should be part of any thorough investigation of land consumption for palm oil and taken into account in future EU policies.

As of 2014, palm oil plantations covered 13 million hectares of land in Indonesia – an area bigger than Denmark, Belgium and the Netherlands combined.[40] Indonesia's production of palm oil has jumped 660% in just 17 years – from 5 million tonnes in 1997 to 33 million tonnes in 2014.[41] Over half of Europe's imports of palm oil come from Indonesia, the figure increasing rapidly in the past decade due to EU biofuels targets.[42] Whether by legal or illegal means, vast swathes of the country which were once virgin forest or community-farmed land, are now given over to huge plantations. Local communities are also suffering harsh social impacts.

Over 700 ongoing land conflicts have been identified by the Indonesian NGO Sawit Watch, highlighting how the oil palm industry is able to take advantage of weak land tenure laws to displace indigenous communities, often separating them from the land they depend on for survival.[43]

Vast areas of Indonesia's forests are crucial for providing food for local communities (through gathering, growing and hunting). An estimated 80-95 million people in Indonesia depend on the forests, including 30-70 million indigenous forest people.[44]

There is also a gender element to the social impact of these land grabs – women are hit disproportionately hard by the loss of families' land. In some cases, women and their children have to work long, unpaid hours on plantations to help their husbands meet over-demanding quotas. Where women work on a hired basis, they often receive lower wages than men.[45]

EU policies promoting the use of biofuels are driving forest conversions for palm oil plantations, and depriving local communities of access to land and the right to define their own food systems. EU policies threaten the food sovereignty of those who rely on land the most.

Using land to grow crops for fuel rather than food increases the level and volatility of food prices internationally, and presents significant risks to the food security of low-income countries such as Indonesia.[46] By promoting land-based biofuels, the EU's policies are indirectly exacerbating the risks of hunger for some of the world's poorest communities.

The rapid, destructive expansion of palm oil has coincided with fires that destroyed an area of Indonesian forests and plantations the size of Belgium in 2015. Years of draining the peat that blankets the floor of the forests to facilitate plantation growth and the timber industry has made much of the land a tinderbox, sparked by burning forests to plant oil palm monocultures.[47]

BGA concession, September 2015.
**© Victor Barro/FoEE**

# 5. THE POTENTIAL ROLE OF THE LAND FOOTPRINT IN EU POLICY MAKING

**The Land Footprint approach can play an important role in the monitoring, modifying and setting of policies and targets related to EU and global sustainable land use. The following sections will highlight a conceptual framework for global sustainable land use and take a look at EU citizen initiatives that can reduce per-capita Land Footprint.**

## 5.1 TOWARDS A CONCEPT FOR GLOBAL SUSTAINABLE LAND USE

It has been emphasised throughout the report that current approaches to global land use are unsustainable, leading to cropland expansion into natural land areas, land degradation, deforestation, biodiversity loss, land grabbing, unequal appropriation of land resources and more. But what can be done to address this from an EU perspective? Research and practice have shown that in order to achieve sustainable global land use, the following three key elements, based on scale, impact and distribution, need to be addressed holistically in policies and governance frameworks related to land use[48] (explained in greater detail further below):

1. **Reduce or halt agricultural expansion into forest or other natural areas**: Land use change (direct and indirect) as a result of EU production and consumption patterns should not lead to deforestation and/or the conversion of other natural areas for agriculture.
2. **Limit impacts related to production practices:** Reducing the land footprint of products may provoke more intensive production practices that embody higher social and environmental impacts. It is therefore important that a broad spectrum of qualitative impacts are measured and monitored by producers and that production occurs under conditions and practices that are environmentally and socially just.
3. **Support changes in consumption patterns that will help reduce per-capita Land Footprint:** Developed countries consume more than their fair share of land. A reduction per-capita is necessary to enable a more equitable land distribution and greater access to land and food in developing countries.

## 5.2 KEY ELEMENT NO.1: REDUCE OR HALT AGRICULTURAL EXPANSION INTO FOREST OR OTHER NATURAL AREAS

Controlling the negative impacts of EU consumption on natural areas beyond the EU requires adequate protection for forested land and other vulnerable ecosystems in the country of production.

We showed in chapter 4 how the Land Footprint indicator can be used to identify where EU consumption is putting pressure on land resources outside the EU. It is also possible to use the Land Footprint approach to calculate a specific deforestation footprint (for example, identifying the quantity of direct and indirect deforestation in Brazil due to soy production destined for EU consumption).[49]

Using these tools would guide EU policy makers and encourage concentration on measures to reduce EU land use in countries with vulnerable ecosystems and/or high deforestation rates.

Policies and targets that focus on changing demand within the EU are likely to be more appropriate and effective in reducing the Land Footprint (discriminating against imports from developing countries can often contravene World Trade Organisation agreements). These could involve, for example, restoring abandoned land within the EU or restrictions on the consumption of bioenergy and biomaterials.

## **5.3** KEY ELEMENT NO.2: LIMIT IMPACTS RELATED TO PRODUCTION PRACTICES

Standards for land management practices such as fertilizer application and tillage practices are generally set by governments at a national level, with a large variance in set practices between countries around the world – some with high environmental protection and strong enforcement, others with poor environmental protection and weak enforcement. Yet our globalized world means countries with good practices, like many within the EU, consume and therefore support the produce of countries with poor practices.

Therefore, the need to monitor and control the spatially explicit production practices of agricultural goods grows with the increasing globalization of food, feed, biofuel and biomaterial markets. Responsible land use is a matter to decision-makers, producers, traders, retailers as well as consumers who indirectly use others' resources. Product-specific measures at the micro level (e.g. biofuels certification) must be complemented by demand-specific measures at the macro level (e.g. policies addressing consumption) in order to prevent problem shifting.[50]

Furthermore, reducing the land footprint of products may provoke more intensive production practices that embody higher social and environmental impacts. Thus, a broad spectrum of qualitative impacts must be measured and monitored by producers, as explained in chapter 4. In addition, measuring the Land Footprint can also be combined with measuring other quantitative, consumption-based impacts such as the carbon, material and water footprints as a first step towards an analysis of the interrelationships between the four impact categories.[51] This gives a better indication of the overall impact of a certain activity or product related to EU consumption.

## **5.4** KEY ELEMENT NO.3: SUPPORT CHANGES IN CONSUMPTION PATTERNS THAT WILL HELP REDUCE PER-CAPITA LAND FOOTPRINT

The Land Footprint can be used to monitor per-capita land use relative to citizens in other countries, with land areas measured based on the average global yield per hectare (see section 3.4). Monitoring the per-capita Land Footprint over time can help countries become aware of where they stand in terms of a fair distribution of global per-capita available land resources.

The implementation of this monitoring in policy making can support a shift towards more equitable consumption patterns at the consumer level in EU member states. Creating a shift in consumption patterns would mean, for example, promoting policy changes which help create a shift from land intensive products like meat, towards less resource intensive food products like plant-based proteins (e.g. legumes), fruits and vegetables.

The box below describes initiatives which are already taking place at a citizen level which can aid in a reduction in per-capita land footprint. There is great potential and need for EU and its member states to support these grassroots actions further through appropriate policies.

# THE POTENTIAL ROLE OF THE LAND FOOTPRINT IN EU POLICY MAKING

CONTINUED

FIGURE **5.1** | POTENTIAL CITIZEN-LED ACTIONS TO REDUCE EU LAND FOOTPRINT

## 1. CLOTHING LIBRARIES

The top 10 companies in the retail clothing sector have a combined Land Footprint of 5,700 km² per year – that's nearly 900,000 football pitches.[52] As fast fashion drives constantly changing trends, clothes are often worn a few times then left in the closet, never to be worn again. However, the clothing exchange movement is growing and one person's trash is becoming another's treasure. Initiatives like "Lånegarderoben" in Sweden, "Lena" in The Netherlands and "La Leche League" in the UK, all lend clothes for a set amount of time and a small fee.

## 5. SHARING THINGS WITH NEIGHBOURS

There are more and more local communities creating online platforms to facilitate sharing, particularly items which are usually used infrequently such as drills. This both helps save resources and helps people get to know their neighbours better. Streetbank is one of the biggest neighbourhood sharing websites in the world. Over 70,000 people are sharing over 90,000 things in their local communities. Popular items include ladders, drills, sewing machines and rollerblades.

**There is a growing awareness among people and communities of the impacts our overconsumption has both within and outside the EU. Driven by environmental, social and economic factors, more and more grassroots movements are challenging the way we consume. Developments such as sharing land to grow food, repair cafes, clothing swaps and packaging-free food shops, all reflect a popular movement to decrease our reliance on virgin resources and build community connections and well-being. The challenge for policymakers is to match this popular will with a political one – these initiatives represent a popular movement towards cutting our resource dependence, which policymakers must take heed of.**

## 2. SHARING LAND TO GROW FOOD

Some 30-40% of global land is currently used for agriculture, and this is expected to increase by 2050.[53] Using areas of land like spare garden spaces to supply local food needs, reduces pressure on global land resources. A UK-based group, "Landshare", connects those who have land to share with those who are looking for land to cultivate food. Since its launch in 2009 it has become a thriving community of more than 55,000 growers, sharers and helpers.

## 3. PRODUCT PACKAGING

There is often large amounts of plastic, paper and other material packaging wrapped around the foods and products we buy, adding extra and unnecessary resource footprints. For example, the Land Footprint for packaging in the toy and the smartphone sectors respectively account for 84% and 55% of the total land required for the final products. There are movements countering these trends however, particularly in the food sector, where a growing number of packaging-free food shops are opening up around Europe, including in Germany, Italy, France and Austria.

## 4. REPAIR CAFES

Our throw-away lifestyles are enabled by the fact that it is often easier and cheaper to buy new than attempt repair; this is how Repair Cafes began in 2009. Now with more than 500 across the globe, these café-style workshops offer an accessible, easy and fun way for people to come together and learn how to repair things. The most popular items brought in and repaired are new household electrical items. Given that the average smartphone has a Land Footprint of 18m², it is clear that by avoiding buying new electrical items (and bigger ones), this reduces pressure on land resources, particularly on mining for metals.[54]

SOURCE: FRIENDS OF THE EARTH EUROPE

# 6. CONCLUSIONS AND RECOMMENDATIONS

**While it is in everyone's interest to use land more sustainably to safeguard our common future, achieving sustainable land use is a complex problem that extends across countries and affects a wide range of different stakeholders from farmers, agribusinesses and food companies, to land developers, governments, consumers and communities relying on small-scale farming for their livelihoods. This makes sustainable land management one of the most complex challenges of our times.**

The report has shown that the EU is using more than its fair share of global agricultural land, with the Cropland and Grassland Footprint together amounting to almost 1.5 times more than what is currently available within the EU. Three quarters of this is associated with the consumption of animal products. Of particular relevance is the growing Cropland Footprint outside of the EU, largely linked to increasing EU consumption of vegetable oils for non-food uses, including biofuels. The considerable dependence on land in other regions is likely to have significant environmental and social impacts.

It is shown that by using the Land Footprint approach to measure and monitor EU global land use and its associated impacts, it is possible to better understand how global land use is affected by EU consumption patterns, economic drivers and policies, and indeed to identify possible modifications to be made to current policies and set new policies and frameworks which will reduce our pressure on the global land system and associated impacts.

## 6.1 BENEFITS OF THE LAND FOOTPRINT FOR POLICY MAKING

The Land Footprint approach is increasingly being recognised as a valuable tool in international, regional and national arenas, including by the EU itself. As with fossil fuels and material use, EU policy makers would benefit from increased insight on its dependency on global land resources. The Land Footprint approach can help policy makers to:

1. **Identify land use impact hotspots in producing countries:** in using accounting methods (economic/biophysical/hybrid) to measure the scale of the EU Land Footprint around the globe and to relate it to products that are consumed within the EU. Measuring and monitoring the scale of the EU's aggregate and detailed Land Footprint enhances the understanding of pressures emerging from EU consumption and production activities and gives hindsight as to where and how to reduce EU induced pressures on vulnerable ecosystems worldwide by effective policy measures and initiatives.
2. **Make land-related environmental and social impacts associated with EU consumption patterns spatially explicit:** the Land Footprint approach can be used as a methodology to link the EU's Land Footprint with environmental and social impact maps, such as deforestation, water scarcity and land grabbing in the country of origin. Current environmental impact maps indicate that land use patterns outside of Europe have relatively high impacts compared to the lower impacts from land use within Europe, and that both the scale and the qualitative impacts of the EU Land Footprint are particularly concentrated in tropical countries. A greater understanding of the drivers behind these trends (including policies linked with materials and fuels of the bioeconomy; how environmental and social standards in producing countries affect trends; which product groups are creating most demand for land and where), will enhance understanding and effectiveness of measures and initiatives to tackle this problem.
3. **Calculate and monitor per-capita land consumption:** global comparisons of per-capita Land Footprints show that EU citizens consume more than their fair share of globally available land resources to fulfill their needs. With limited available land resources and a growing global population, efforts must be made by high-consuming countries to decrease their per-capita Land Footprint. Monitoring a per-capita Land Footprint would increase awareness of the land requirements for consumption patterns and lifestyles, and encourage policy measures to support a shift towards more sustainable consumption.

# CONCLUSIONS AND RECOMMENDATIONS

CONTINUED

## 6.2 RECOMMENDATIONS FOR POLICY MAKERS

The concrete actions outlined below are steps EU policy makers can take to realise the benefits of Land Footprint tools and transition to a more sustainable and equitable use of global land:

1. **Implement the Land Footprint at EU and Member State level:** measurement and monitoring of the Land Footprint, leading to reduction targets, should be part of impact assessments in all policies and initiatives linked with EU land use (e.g. the EU Bioeconomy Strategy, EU Sustainability Strategy, EU Common Agricultural Policy), and in the Economic Semester for EU Member States. The Cropland Footprint in particular, is ready to be implemented immediately, and is also the most important to reduce, due to the EU's increasing use of cropland outside its borders and potentially high associated impacts.
2. **Develop policies and incentives that encourage a reduction in the consumption of land intensive products or products that embody relatively high environmental impacts:** By taking a consumption-based approach to land use and related impacts, it is possible to identify the full impact of a product over its whole life cycle and thus introduce measures to reduce land intensive and high-impact products such as most products from animal origin.
3. **Extend global databases:** funding needs to be made available to support data collection of grassland and forest use, and data on land use in non-agricultural activities such as mining, urban expansion and infrastructure development. This will result in the Land Footprints being calculated for a wider range of end-products, and identifying impact-hotspots associated with these activities (especially important given the high impacts of mining and predicted growth in urban areas).
4. **Support further research into Land Footprint and impact accounting methods:** whilst current accounting methods and data can be used to calculate basic Land Footprints, there is scope for refining the land allocation procedures and to link the detailed EU Land Footprint to spatially explicit environmental and social impacts; further support of research into underlying drivers and causes of land system changes and the role of key actors therein is necessary to come to a more fair allocation of land use and land-related environmental and social impacts.
5. **Develop a monitoring framework that includes, from a life-cycle perspective, the core resource input categories of land, water and materials, plus the output category of greenhouse gas emissions:** In order to capture a holistic picture of the EU's quantitative resource use, environmental load and possible shifts of environmental pressures related to domestic production or consumption to other countries and world regions.
6. **Reduce the use of land resources outside of Europe for non-food purposes,** in particular the phasing out of first-generation feedstock for EU bioenergy.
7. **Promote the reduction of livestock farming in the EU and the growth of crop production for direct human consumption,** e.g. protein crops such as beans, soy or lupins.
8. **Land management measures within the EU:** improve land management and land use planning within the EU in order to minimize the expansion of built-up land on fertile soils; invest in the restoration of degraded land and soils; involve farmers and promote land tenure and ownership.
9. **Support citizen initiatives that encourage changes in consumption and resource use patterns:** support of grassroots initiatives by citizens and communities to consume less and become more resource efficient e.g. urban farming, repair cafes, clothing and tool libraries; acting to tackle food waste e.g. by an ambitious EU-specific target on food waste reduction as part of the Circular Economy Package; change consumption patterns towards more vegetal diets by promotion of campaigns in this area.

# REFERENCES


1 Fischer G., S. Tramberend, M. Bruckner and M. Lieber, forthcoming. Quantifying the of Germany and the EU using a hybrid accounting model. Dessau: German Federal Environment Agency.

2 UNEP, 2014. Assessing Global Land Use: Balancing Consumption with Sustainable Supply. A Report of the Working Group on Land and Soils of the International Resource Panel. Bringezu S., Schütz H., Pengue W., O´Brien M., Garcia F., Sims R., Howarth R., Kauppi L., Swilling M., and Herrick J.

3 BIO by Deloitte, AMEC, IVM and WU, 2014. Study supporting potential land and soil targets under the 2015 Land Communication, Report prepared for the European Commission, DG Environment. Brussels.

4 Land Matrix Observatory (2015) http://www.landmatrix.org/en/; Haberl H., C. Mbow, X. Deng, E. G. Irwin, S. Kerr, T. Kuemmerle, O. Mertz, P. Meyfroidt, and B. L. Turner II. (2014). Finite Land Resources. In: "Rethinking Global Land Use in an Urban Era," edited by Karen C. Seto and Anette Reenberg. Strüngmann Forum Reports, vol. 14. Cambridge.

5 Lange S. (2008). Land Tenure and Mining in Tanzania. CMI Report 2008:2. http://www.cmi.no/publications/file/3008-land-tenure-and-mining-in-tanzania.pdf

6 Hall, D. (2013). Primitive Accumulation, Accumulation by Dispossession and the Global Land Grab. Third World Quarterly 34 (9): 1582–1604; van der Ploeg, J., J. C. Franco & S. M. Borras Jr (2015). Land concentration and land grabbing in Europe: a preliminary analysis, Canadian Journal of Development Studies / Revue canadienne d'études du développement, 36:2, 147-162, DOI:10.1080/02255189.2015.1027673

7 Schoneveld, G.C. 2011 The anatomy of large-scale farmland acquisitions in sub-Saharan Africa. Working paper 85. Center for Internaional Forestry Research (CIFOR), Bogor, Indonesia. http://www.cifor.org/publications/pdf_files/wpapers/wp85schoneveld.pdf

8 Matthews A. 2015. The CAP and development. Chapter 22 in: Research Handbook on EU Agriculture Law. 608 p. http://www.researchgate.net/publication/270158338

9 Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, III, E. Lambin, T. M. Lenton, M. Scheffer, C. Folke, H. Schellnhuber, B. Nykvist, C. A. De Wit, T. Hughes, S. van der Leeuw, H. Rodhe, S. Sörlin, P. K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R. W. Corell, V. J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J. Foley, 2009. Planetary boundaries: exploring the safe operating space for humanity. Ecology and Society 14(2): 32.

10 Steffen W., K. Richardson, J. Rockström, S.E. Cornell, I. Fetzer, E.M. Bennett, R. Biggs, S.R. Carpenter, W. de Vries, C.A. de Wit, C. Folke, D. Gerten, J. Heinke, G.M. Mace, L.M. Persson, V. Ramanathan, B. Reyers and S. Sörlin, 2015. Planetary boundaries: Guiding human development on a changing planet. Sciencexpress. sciencemag.org/content/early/recent/15 January 2015 / Page 1 /10.1126/science.1259855

11 Bringezu, S. (2013). Targets for Global Resource Consumption. Factor X: Policy, Strategies and Instruments for a Sustainable Resource Use. M. Angrick, A. Burger and H. Lehmann. Berlin, Springer.

12 European Commission, 2013. The impact of EU consumption on deforestation: comprehensive analysis of the impact of EU consumption on deforestation. DG ENV Technical Report—2013–063. European Commission, Brussels.

13 Kastner, T., M. J. I. Rivas, W. Koch, and S. Nonhebel (2012) Global changes in diets and the consequences for land requirements for food. Proceedings of the National Academy of Sciences 109(18): 6868-6872.

14 BIO *et al*. 2014; Yu, Y., Feng, K., Hubacek, K., 2013. Tele-connecting local consumption to global land use. Global Environmental Change 23, 1178–1186; Seto, K.C., Reenberg, A., Boone, C.G., Fragkias, M., Haase, D., Langanke, T., Marcotullio, P., Munroe, D.K., Olah, B., Simon, D., 2012. Urban land teleconnections and sustainability. Proc. Natl. Acad. Sci. 109, 7687–7692.

15 EEA, 2010. The European Environment. State and outlook 2010. Land use. Copenhagen: European Environment Agency; FAO. 2011. The state of the world's land and water resources for food and agriculture (SOLAW) – Managing systems at risk. Food and Agriculture Organization of the United Nations, Rome and Earthscan, London. http://www.fao.org/docrep/017/i1688e/i1688e.pdf

16 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0571

17 http://ec.europa.eu/environment/resource_efficiency/documents/erep_manifesto_and_policy_recommendations_31-03-2014.pdf

18 http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2015-0266+0+DOC+XML+V0//EN&language=EN

19 BIO *et al*. 2014

20 Europe's Land Import Dependency, October 2011 https://www.foeeurope.org/sites/default/files/resource_use/2015/5_-_briefing_europe_global_land_demand_7_october.pdf , Hidden Impacts, February 2013 https://www.foeeurope.org/sites/default/files/publications/foee_report_-_hidden_impacts_-_070313.pdf , Land Footprint Scenarios, October 2013 https://www.foeeurope.org/sites/default/files/publications/seri_land_footprint_scenario_nov2013_1.pdf , A calculation of the EU bioenergy land footprint, March 2014 https://www.foeeurope.org/sites/default/files/agrofuels/2015/foee_bioenergy_land_footprint_may2014.pdf

21 Bruckner, M., de Schutter, L., Martinez, A., Giljum, S., 2014. Consumption-based accounts of land use related greenhouse gas emissions for the European Union. In: BIO IS (Ed.), Resource Efficiency Policies for Land use Related Climate Mitigation. Final Report Prepared for the European Commission, DG CLIMA. Bio Intelligence Service at Deloitte, Paris; Bruckner M., G. Fischer, S. Tramberend, S. Giljum. 2015. Measuring telecouplings in the global land system: A review and comparative evaluation of land footprinting accounting methods. Ecological Economics 114(2015)11-21.

22 Bruckner M, Giljum S, Fischer G, Tramberend S (2014). Review of land flow accounting methods and recommendations for further development. Vienna University of Economic and Business, International Institute for Applied Systems Analysis, on behalf of the Federal Environment Agency (Umweltbundesamt) Germany; Wiedmann T. 2009. A review of recent multi-region input–output models used for consumption-based emission and resource accounting. Ecological Economics 69(2) 211-222; Yu *et al*. 2013.

23 Kastner T., A. Schaffartzik, N. Eisenmenger, K.-H. Erb, H. Haberl, F. Krausman, 2014. Cropland area embodied in international trade: contradictory results from different approaches. Ecological Economics, 104 (2014), 140–144; O' Brien, M., H. Schütz and S. Bringezu, 2015. The land footprint of the EU bioeconomy: Monitoring tools, gaps and needs. Land Use Policy 47(September) 235-246; Schaffartzik A., H. Haberl, T. Kastner, D. Wiedenhofer, N. Eisenmenger and K.H. Erb, 2015. Trading Land: A Review of Approaches to Accounting for Upstream Land Requirements of Traded Products. Journal of Industrial Ecology 19(5) 703-714.

24 Bruckner *et al*, 2015; Fischer *et al*., forthcoming

25 Bruckner *et al*. 2015

# REFERENCES

CONTINUED


**26** Fischer *et al*., forthcoming

**27** UNEP, (2012). Global Environmental Outlook 5: Environment for the future we want. United Nations Environment Programme http://www.unep.org/geo/pdfs/geo5/ GEO5_report_full_en.pdf

**28** Fischer *et al*., forthcoming

**29** de Schutter and Giljum, 2014; Fischer *et al*., forthcoming

**30** Mind Your Step, May 2015 https://www.foe.co.uk/sites/default/files/downloads/mind-your-step-report-76803.pdf

**31** Pichler, M. (2014). Umkämpfte Natur. Politische Ökologie der Palmöl- und Agrartreibstoffproduktion in Südostasien. Verlag Westfälisches Dampfboot.

**32** Fischer *et al*., forthcoming

**33** as in Wackernagel, M., C. Monfreda, N. B. Schulz, K.H. Erb, H. Haberl, F. Krausmann, 2004. Calculating national and global ecological footprint time series: Resolving conceptual challenges. Land Use Policy, 21(3), 271-278.

**34** Rockström *et al*. 2009

**35** FAO (2011). The state of the world's land and water resources for food and agriculture (SOLAW) – Managing systems at risk. Food and Agriculture Organization of the United Nations, Rome and Earthscan, London; Lambin, E.F., and Meyfroidt, P. (2011). Global Forest Transition: Prospects for an End to Deforestation. Annual Review of Environment and Resources, Vol. 36, pp. 343-371, 2011; UNEP, 2014.

**36** H.K. and J.M. Salmon (2015). Mapping the world's degraded lands. Applied geography 57(2015) 12-21.

**37** BIO *et al*. 2014.

**38** Bruckner, M., de Schutter, L., Martinez, A., Giljum, S., (2014). Consumption-based accounts of land use related greenhouse gas emissions for the European Union. In: BIO IS (Ed.), Resource Efficiency Policies for Land use Related Climate Mitigation. Final Report Prepared for the European Commission, DG CLIMA. Bio Intelligence Service at Deloitte, Paris

**39** Alexandratos and Bruinsma, (2012). World agriculture towards 2030/2050: the 2012 revision. ESA Working paper No. 12-03. Rome, FAO. http://www.fao.org/fileadmin/templates/esa/Global_persepctives/world_ag_2030_50_2012_rev.pdf

**40** http://foeeurope.org/sites/default/files/publications/briefing - indonesia-on-the-front-line_0.pdf

**41** US Department of Agriculture http://www.indexmundi.com/agriculture/?country=id&commodity=palm-oil&graph=production

**42** International Institute for Sustainable Development (IISD), for Friends of the Earth Europe (2013): The EU Biofuel Policy and Palm Oil: Cutting subsidies or cutting rainforest? http://www.foeeurope.org/sites/default/files/press_releases/iisd_eu_biofuel_policy_palm_oil_september2013.pdf

**43** http://foeeurope.org/sites/default/files/publications/briefing - indonesia-on-the-front-line_0.pdf

**44** http://www.forestpeoples.org/topics/rights-land-natural-resources/publication/2014/securing-forests-securing-rights-report-intern

**45** http://foeeurope.org/sites/default/files/publications/briefing - indonesia-on-the-front-line_0.pdf

**46** Rob Bailey (2013). The trouble with biofuels: costs and consequences of expanding biofuel use in the United Kingdom. Energy, Envrionment and Resources EER PP 2013/01. Chatham House.

**47** http://www.theguardian.com/commentisfree/2015/oct/30/indonesia-fires-disaster-21st-century-world-media

**48** BIO *et al*. 2014. Bringezu, S. (2013). Targets for Global Resource Consumption. Factor X: Policy, Strategies and Instruments for a Sustainable Resource Use. M. Angrick, A. Burger and H. Lehmann. Berlin, Springer.

**49** EC, 2013.

**50** UNEP 2014.

**51** https://www.foeeurope.org/sites/default/files/publications/FoEE_SERI_measuring_europes_resource_use_0609.pdf

**52** Friends of the Earth England, Wales and Northern Ireland 2015: Mind Your Step https://www.foe.co.uk/sites/default/files/downloads/mind-your-step-report-76803.pdf

**53** United Nations Environment Programme 2013: Assessing Global Land Use http://www.unep.org/resourcepanel/Portals/24102/PDFs/Summary-English.pdf

**54** Friends of the Earth England, Wales and Northern Ireland, 2015

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