



*Skógfræðingafélag Íslands er faglegt hagsmunafélag sem hefur það að meginmarkmiði að vera:*  
*a) málsvari skógfræðinga, b) efla samheldni og stuðla að bættri faglegri, fjárhagslegri og félagslegri*  
*aðstöðu þeirra og c) upplýsa aðra um menntun, færni og þekkingu skógfræðinga og vekja með því*  
*áhuga á starfsvettvangi þeirra.*

Reykjavík, 11. nóvember 2011

Nefndasvið Alþingis,  
Austurstræti 8-10,  
nefndasvid@althingi.is,  
150 Reykjavík.

**Erindi: Umsögn Skógfræðingafélags Íslands um tillögu til þingsályktunar um eflingu græna hagkerfisins á Íslandi, þingskjal 7 - 7. mál. - Lagt fyrir Alþingi á 140. Löggjafarþingi 2011-2012.**

Stjórn Skógfræðingafélags Íslands hefur farið yfir ofangreinda tillögu og skýrslu að þingsályktun.

Í hinni ítarlegu skýrslu sem fylgir tillögunni er gerð grein fyrir ýmsum aðgerðum sem ætlað er að stuðla að eflingu græna hagkerfisins. Skógfræðingafélagi Íslands þykir sárlega vanta, að vakin sé athygli á því í skýrslunni að skógrækt á Íslandi er ein augljósasta og skilvirkasta leið til þess að ná þeim markmiðum sem sett eru fram í stefnumótun tillögunnar (í liðum merktun a. til h.).

Á 138. löggjafarþingi var samþykkt þingsályktun um eflingu græna hagkerfisins. Í nefndaráliti með breytingatillögu sem samþykkt var 7. júní 2010 kemur fram að:

„Nefndin er sammála þeim ábendingum er komu fram hjá umsagnaraðila að mikilvægt sé að sú nefnd sem skipuð verði af Alþingi fjalli sérstaklega um hlut skógræktar í sjálfbærri þróun og eflingu græns hagkerfis en hugtakið sjálfbær þróun á rætur sínar að rekja til umfjöllunar um skógrækt“. (<http://www.althingi.is/altext/138/s/1218.html>)

Í ljósi þess finnst Skógfræðingafélagi Íslands skjóta skökku við, að í þingskjali 7-7 skuli hvergi vera vikið að hlutverki skógræktar við að ná markmiðum um grænt hagkerfi. Stuðningur við uppbyggingu skógarauðlindar og sjálfbæra nýting skóga getur átt eftir að skila Íslendingum geysimiklum umhverfislegum, félagslegum og peningalegum verðmætum í framtíðinni. Með því leggur skógrækt sitt lóð á vogarskálarnar til þess að ná markmiðum um sjálfbærni, sköpun nýrrar, endurnýjanlegrar auðlindar og eflingu græna hagkerfisins. Eftirfarandi orð Skúla Helgasonar er hann flutti tillögunna á Alþingi þ. 18. okt. 2011, gæti jafnframt verið lýsing á skógrækt eins og hún er og hefur verið stunduð á Íslandi:

„Í grænu hagkerfi er áhersla lögð á atvinnustarfsemi sem dregur úr mengun og losun gróðurhúsalofttegunda, stuðlar að bættri nýtingu orku og auðlinda og kemur í veg fyrir

hnignun líffræðilegrar fjölbreytni og þjónustu vistkerfa. Í stuttu máli getum við sagt að grænt hagkerfi einkennist af aukinni verðmætasköpun á sama tíma og dregið er úr álagi á náttúruna.“ (<http://www.althingi.is/altext/raeda/140/rad201111018T141026.html>)

Árið 2011 er Alþjóðlegt ár skóga hjá Sameinuðu þjóðunum. Í drögum að aðgerðaáætlun S.Þ. um leiðir til þess að bæta hlut skógræktar í grænu hagkerfi (e. *UNECE/FAO draft Action Plan to improve the contribution of the forest sector to the green economy*) eru kynntar fimm stoðir aðgerðaáætlunarinnar:

1. Sjálfbær nýting skóga til framleiðslu viðarafurða
2. Lágmarkun á nettó-losun við nýtingu og vörslu skógarins
3. Græn störf í skógargeiranum (e. forest sector)
4. Greiðslur fyrir vistkerfisþjónustu skóga
5. Eftirlit með stjórnsýslu (e. governance) í skógargeiranum (e. *Action Plan on Forests and the Green Economy*; <http://www.un-ngls.org/spip.php?article3415>)

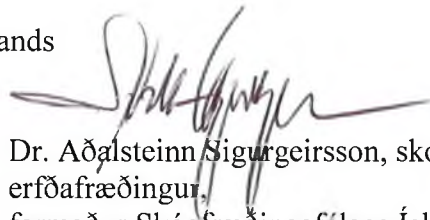
Þar sem Sameinuðu þjóðirnar tileinka árið 2011 skógum, færi vel á því af hálfu hins háa Alþingis, að við endurskoðun skýrslunnar yrði gaumur gefinn að þætti skógræktar og að hlutur skógræktar í endurskoðaðri skýrslu verði samræmdur leiðbeinandi stefnu S.Þ. á því sviði. Við þá vinnu verði höfð hliðsjón af leiðbeiningum umhverfisáætlunar S.Þ. (UNEP (2011) sem lagðar eru fram í skýrslunni „*Forests in a Green Economy*“ ([http://www.unep.org/pdf/PressReleases/UNEP-ForestsGreenEco-basse\\_def\\_version\\_normale.pdf](http://www.unep.org/pdf/PressReleases/UNEP-ForestsGreenEco-basse_def_version_normale.pdf)).

Í sama anda og fram kemur í tillögu Skógræktar ríkisins, leggur Skógfræðingafélag Íslands til að 49. lið verði bætt við tillöguna og að hún hljóði svo:

49. Stutt verði við þau áform sem koma fram í lögum um landshlutaverkefni í skógrækt nr. 95 13 júlí 2006 og kveða m.a. á um að skógur verði ræktaður á 5% lands undir 400 m hæð. Einnig verði stuðningur aukinn við önnur verkefni er snúa að uppbyggingu skógarauðlindar og þróun á sjálfbærri nýtingu hennar. Skógrækt er atvinnuskapandi og umhverfisbætandi, ekki hvað síst um vernd jarðvegs og vatns og til að stemma stigu við loftslagsbreytingar. Sjálfbær nýting ræktaðra nytjaskóga gæti orðið þeim mun styrkari stoð undir íslenskt efnahagslíf í framtíðinni, sem meira fæst af þolinmóðu fjármagni til skógræktar. Fjárfesting í skógrækt stuðlar að grænu hagkerfi og leggur fjársjóð í hendur framtíðar. Með aukinni skógrækt myndu núlifandi kynslóðir leggja drög að bættum lífsskilyrðum þeirra, sem nú eru börn og síðari kynslóða á Íslandi.

Skógfræðingafélag Íslands lýsir sig reiðubúið að aðstoða nefnd Alþingis við að bæta við umfjöllun um hlut skógræktar í sjálfbærri þróun og eflingu græns hagkerfis, í endurskoðaðri skýrslu.

Með góðum skógræktarkveðjum  
F.h. stjórnar Skógfræðingafélags Íslands



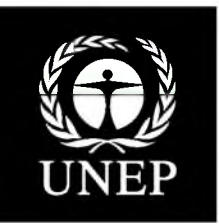
Dr. Aðalsteinn Sigurgeirsson, skógfræðingur og erfðafræðingur,  
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**Fylgiskjöl:**

(1) UNEP. 2011. Forests in a Green Economy – A Synthesis. United Nations Environment Programme, May 2011.

(2) „Skógræktarráðstefnan Heimsins græna gull var haldin Hörpunni: Ísland er eftirbátur nágranna sinna“. Bændablaðið, 10.11.2011, bls. 20.

(3) „Stórfelldur markaður fyrir viðarmassa“.Bændablaðið, 10.11.2011, bls. 21.



# Forests in a **GREEN** economy

A Synthesis





**This synthesis examines the critical role of forests in a green economy, and provides policy recommendations to radically transform the forest sector such that it can lead to sustainable development and poverty eradication.<sup>1</sup>**

1. This synthesis is based on the following documents:

UNEP (2011): *Toward a Green Economy – Pathways to Sustainable Development and Poverty Eradication*. Available at: <http://www.unep.org/greeneconomy/>

UNEP (2011) *REDDy Set Grow, A briefing for financial institutions, Part 1. Opportunities and roles for financial institutions in forest carbon markets*. United Nations Environment Programme, Financial Initiative, Geneva, Switzerland.

UNEP (2011). *UNEP Year Book 2011: Emerging issues in our Global Environment*, United Nations Environment Programme, Nairobi. Published February 2011. Website: <http://www.unep.org/yearbook/2011Project>

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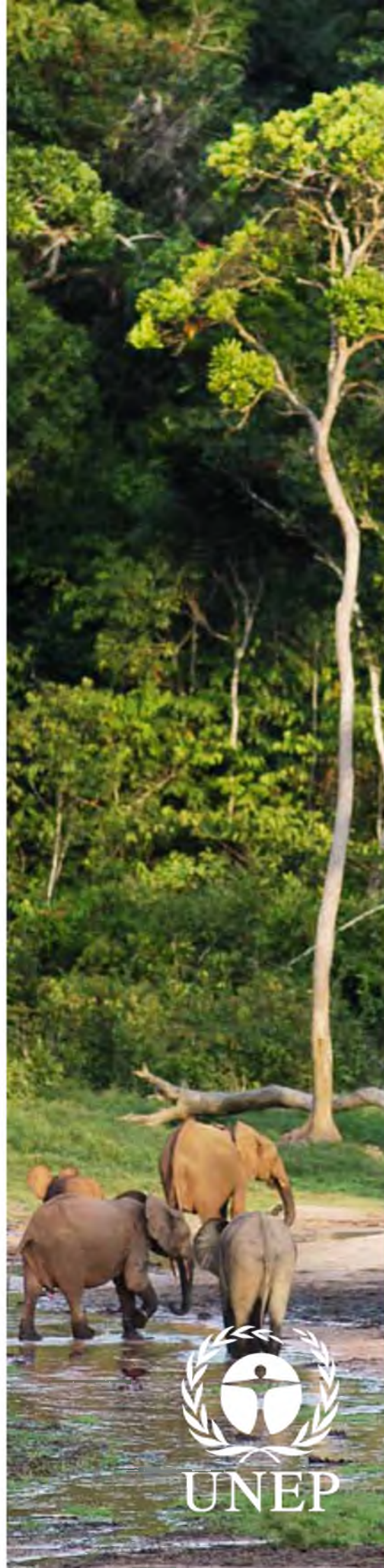
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1. Contributions by forests and the current state of play
2. The role of forests in a green economy
3. Investments in the forest sector
4. Policy recommendations for forests in a green economy
5. Success stories
6. Conclusion



# FOREWORD





**Forests are a critical link in the transition to a green economy – one that promotes sustainable development and poverty eradication as we move towards a low-carbon and more equitable future.**

Biologically-rich forest ecosystems provide shelter, food, jobs, water, medicine and security to more than 1 billion people, as well as regulate our global climate. The benefits of halving deforestation for climate change alone is estimated to be in the trillions. Yet despite these huge ecological, economical, social and health benefits, forests are still being destroyed at an alarming rate – 13 million hectares annually – often for limited private and short-term gains. While we have a suite of proven sustainable forestry practices and policies that work, they must now be scaled up and enforced to safeguard these natural assets.

The International Year of Forests, 2011 is an unprecedented opportunity for governments, civil society and business to embrace and embed a range of mechanisms – from certified timber schemes to community-based partnerships – that harness the benefits of well-managed forests.

Drawing on the recently published Green Economy Report, this UNEP brief illustrates that investing in forest maintenance and reforestation activities could make a significant contribution to the green economy transition. Not only would it catalyze economic activity and generate new employment, but it would also reduce the vulnerability and risk posed by increasing climate change.

*Forests in a Green Economy* provides an evidence-based roadmap for policy makers, the private sector, forest sector and forest dwellers alike, and underscores why these ecosystems must be managed for their full societal value if we are to successfully build a low-carbon, resource efficient future.

Achim Steiner

UNEP Executive Director  
 United Nations Under-Secretary General





# 1. CONTRIBUTIONS BY FORESTS AND THE CURRENT STATE OF PLAY

This synthesis is part of UNEP's contributions to the RIO+20 process and the green economy discourse. It is directed at policy makers and presents a menu of alternatives that can enable a transformation of the sector, one that can better realize the myriad possibilities forests promise. It also examines the conditions for significantly increasing investments in forests and the underlying goods and services forests provide.



**Economic progress and human well being are dependent on healthy forests. Forests serve as carbon sinks and stabilize global climate, regulate water cycles and provide habitats for biodiversity while hosting a wide variety of genetic resources. Economic valuation studies conducted in different countries have demonstrated the important benefits from forests, in particular for climate regulation services and existence values.**

### Forests generate income and provide employment

The Food and Agriculture Organization of the United Nations (FAO) estimated that the forest industry contributed approximately US\$ 468 billion or 1 per cent of global gross value added to global GDP in 2006.<sup>2</sup> Pulp and paper represented about 40 per cent of this contribution.<sup>3</sup> A review of 54 case studies, over half of which were from Eastern and Southern Africa, estimated that the average annual income from forests amounted to 22 per cent of household income.<sup>4</sup> (Also see Table 1).

**Table 1: Estimates of the Value of Forest Ecosystem Services**

Service	Estimates of value (US\$/ha)
Genetic material	Less than 0.2 to 20.6 <sup>a</sup> 0 to 9,175 <sup>b</sup> 1.23 <sup>c</sup>
Watershed services (e.g. flow regulation, flood protection, water purification)	200 to more than 1,000 for a combination of several services in tropical areas. <sup>d</sup> 0 to 50 for a single service. <sup>d</sup>
Climate regulation	650 to 3,500 <sup>e</sup> 360 to 2,200 <sup>f</sup> in tropical forests 10 to more than 400 <sup>d</sup> in temperate forests
Recreation/tourism	Less than 1 to more than 2,000 <sup>d</sup>
Cultural services and existence values	0.03 to 259 <sup>d</sup> in tropical forests 12 to 116,182 <sup>d</sup> in temperate forests

a Lower estimate: California and Higher Estimate: Western Ecuador. Simpson, R.D., R.A. Sedjo and Reid, J.W. (1996). "Valuing biodiversity for use in pharmaceutical research" *Journal of Political Economy*, Vol. 104, Issue 1, pp. 163-183.

b Rausser, G. and Small, A. (2000). "Valuing research leads: Bioprospecting and the conservation of genetic resources". *Journal of Political Economy*, Vol. 108, Issue 1, pp. 173-206.

c Mean estimate for most biodiverse region. Costello, C. and Ward, M. (2006). "Search, bioprospecting and biodiversity conservation". *Journal of Environmental Economics and Management*, Vol. 52, Issue 3, pp. 615-626.

d Mullan, K., and Kontoleon, A. (2008). Benefits and costs of forest biodiversity: Economic theory and case study evidence. Final report, June.

e IIED (2003). Valuing forests: A review of methods and applications in developing countries. Environmental Economics Programme, International Institute for Environment and Development, London, United Kingdom.

f Pearce, D.W. (2001). "The economic value of forest ecosystems", *Ecosystem Health*, Vol. 7, Issue 4, pp. 284-296.

Forests also provide an essential source of cash especially during poor harvests. The Center for International Forestry Research (CIFOR) estimates that families living in and around forests derive an average of one-fifth to one-fourth of their income from forest based resources.<sup>5</sup>

In many countries, non-timber forest products (NTFPs) contribute prominently to local economies and livelihoods and are important exports. NTFPs include food, plant products, medicine, aromatic products and exudates such as tannin extract and raw lacquer. FAO (2005) estimated that the value of NTFPs extracted from forests worldwide amounted to US\$ 18.5 billion in 2005. It underscored these as lower bound values because of incomplete data.

Forests also provide employment. Although the figures range widely, studies show that more than a billion people depend on forests for incomes and employment (Table 2). Much of this may be in the informal sector: a recent study by CIFOR on informal timber production in Cameroon, estimates that 45,000 people earn their living from such production in the country.<sup>6</sup>

### Forests provide nutrition, reduce vulnerability and diminish energy scarcity

Globally, forested watersheds, wetlands and mangrove ecosystems provide nutrition to poor households. In addition to sustaining freshwater and coastal fisheries, food sources including NTFPs such as fruits, nuts, honey, and mushrooms are an important source of nutrition.<sup>7</sup> A 2008 review of bushmeat affirmed that rural communities in Central Africa obtained a critical portion of their protein and fat from forests.<sup>8</sup>

More than 2 billion people depend on wood energy for cooking, heating and food preservation.<sup>9</sup>

2. FAO (2009). *State of the world's forest 2009*, Food and Agriculture Organization of the United Nations, Rome, Italy.

3. The forest industry is defined as round wood production, wood processing, and pulp and paper.

4. Vedeld, R., Angelsen, A., Sjaastad, E., and Kobugabe Berg, G. (2004). Counting on the environment forest incomes and the rural poor. Environmental Economics Series, Paper No. 98, World Bank Environment Department, World Bank, Washington D.C., USA.

5. <http://blog.cifor.org/2011/04/10/penelitian-sosial-penting-untuk-melestarikan-praktek-konservasi-masyarakat/>

6. <http://www.cifor.cgiar.org/nc/online-library/browse/view-publication/publication/3315.html>

7. <http://blog.cifor.org/2011/04/20/forests-and-food-security-what-we-know-and-need-to-know/>

8. Nasi, R., Brown, D., Wilkie, D., Bennett, E., Tutin, C., van Tol, G., and Christophersen, T. (2008). Conservation and use of wildlife-based resources: the bushmeat crisis. Secretariat of the Convention on Biological Diversity, Montreal, and Center for International Forestry Research (CIFOR), Bogor, Indonesia.

9. UNDP (2000). *World Energy Assessment. Energy and the challenge of sustainability*. United Nations Development Programme, United Nations Department of Economics and Social Affairs and World Energy Council. New York. Available at: <http://www.undp.org/energy/activities/wea/drafts-frame.html>.

According to the International Energy Agency (IEA), in 2005, biomass energy accounted for an estimated 10 per cent of energy use.<sup>10</sup> More than 83 per cent of this is used in less developed countries. In many developing countries biomass accounts for more than 50 per cent of total energy use. Halting tropical deforestation and planting new forests could represent the mitigation potential equivalent of doubling current global nuclear energy capacity or constructing two million new wind turbines.<sup>11</sup> Unfortunately, the values and services that forests render are rarely captured in national accounting systems.

**Table 2: Forest-dependent Employment and Livelihoods**

Scope	Estimates (number of people)
Formal employment in forestry, wood processing and pulp and paper	14 million <sup>a</sup>
Formal employment in furniture industry	4 million <sup>b</sup>
Informal small forest enterprises	30-140 million <sup>c</sup>
Indigenous people dependent on forests	60 million <sup>d</sup> 500 million-1.2 billion <sup>e</sup>
People dependent on agroforestry	71-588 million <sup>f</sup>
Total	1.19 million-1.42 billion <sup>g</sup>

- a FAO (2009). State of the world's forest 2009, Food and Agriculture Organization of the United Nations, Roma, Italy.
- b Nair, C.T.S., and Ruth, R. (2009). "Creating forestry jobs to boost the economy and build a green future", *Unasylva*, Vol. 60, No. 233, pp. 3-10. Available at : <ftp://ftp.fao.org/docrep/fao/012/t1025e/t1025e02.pdf>
- c For low estimates (Poschen, R (2003) "Globalization and sustainability: The forestry and wood industries on the move- social and labour implications"; European Tropical Forest Research Network News, Autumn/Winter pp. 43-45) and for high estimates (Kozak, R, (2007) Small and medium forest enterprises: Instruments of change in the developing world rights and resources initiative, Washington, D.C., USA).
- d World Bank (2004). Sustaining forests: A development strategy, Washington, DC, R 16.
- e UNEP/ILO/IOE/ITUC (2008). Green jobs: Towards decent work in a sustainable, low- carbon world. United Nations Environmental Programme (UNEP), Nairobi, Kenya.
- f Zomer, R, Trabucco, A., Coe, R. and Place, F. (2009). Trees on farm: Analysis of global extent and geographical patterns of agroforestry. ICRAF Working Paper no. 89. World Agroforestry Centre, Nairobi, Kenya. ( For agricultural land with 10 per cent tree cover up to 50 per cent)
- g Lower bound assumes overlap between indigenous people dependence and agroforestry

**Trends in deforestation, though showing signs of decline, are still alarmingly high.** Despite the considerable value of forests, deforestation is rampant. The world's forested area is declining both in absolute terms (deforestation) and in

net terms (taking account of forest planting and natural expansion), although at a slower rate than in previous decades (See Table 3). On average, 13 million hectares of tropical forests (an area the size of Greece) are disappearing annually. This is equivalent to approximately six billion tonnes of carbon dioxide being released into the atmosphere, contributing up to one-fifth of global greenhouse gas emissions.<sup>12</sup>

These global trends conceal important regional variations. Over the past decade, forest cover stabilized in North and Central America and expanded in Europe. Forest cover expanded in Asia, mainly due to large-scale afforestation in China, which offset continued deforestation in South-east Asia. Africa and South America experienced the largest net loss of forests during this period.

These figures also mask the loss of natural forests. The general global trend is that natural forests and modified natural forests are decreasing while planted forest area is increasing.<sup>13</sup> Forty million hectares of natural forests have been lost since 2000. The loss of natural forests implies important and critical losses in biodiversity and decreasing forest ecosystem resilience against climate change.

**The current approach to management of forests is a 'frontier' approach.** Today, investments in forests remain low and forest related activities are predominantly extractive. Over the last two decades, agricultural expansion and timber extraction were the main proximate causes of tropical deforestation.

This pressure is likely to worsen with increasing population, rising incomes and a shift toward meat based diets. Additionally, market failures increase the likelihood of exploitation without considering the full range of forests goods and services. The Eliasch Review (2008) estimates that the net present value of reduced climate change benefits associated with emission reductions from halving deforestation from 2010 to 2100, is US\$ 3.7 trillion on average.<sup>14,15</sup> It also finds that the average benefit from halving deforestation exceeds average costs by a factor of more than three.<sup>16</sup>

10. <http://www.cifor.cgiar.org/nc/online-library/browse/view-publication/publication/3315.html>

11. Pacala, S., Socolow, R. (2004). Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* 305: 968-972.

12. UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Available at: <http://hqweb.unep.org/greeneconomy/>

13. FAO (2010). Key findings global forest resources assessment 2010. Food and Agriculture Organization of the United Nations, Rome, Italy. Available at: [www.fao.org/forestry/ifa2010](http://www.fao.org/forestry/ifa2010).

14. Eliasch, J. (2008). The Eliasch Review- climate change: Financing global forests. UK Office of Climate Change.

15. With a 90 per cent confidence interval (CI) of US\$ 0.6 to US\$ 17 trillion.

16. For the scenario where emissions reduced by 50 per cent, the returns to cost of investment was 3.12. For the scenario, where deforestation caused emissions reduced by 90 per cent, the returns to investment were 2.86.



**Table 3: Trends in Forest Cover and Deforestation**

	1990 (Million hectares)	2010 (Million hectares)
Africa forest area	750	670
Africa planted forest area**	11.6	15.3
Asia forest area	580	590
Asia planted forest area**	70.8	120
Europe forest area	990	1000
Europe planted forest area**	58	69
Caribbean forest area	5.9	6.9
Caribbean planted forest area**	0.4	0.55
North and Central America forest area	708	705
North and Central America planted forest area **	19.6	38
South America forest area	950	860
South America planted forest area**	8	13.8
World forest area	4170	4030
World planted forest area**	178	264
	1990-2000 (Million hectares/Year)	2000-2010 (Million hectares/Year)
Annual net forest loss	8.3	5.2
Annual deforestation	16*	13
Annual increase in planted forest	3.6	4.9

**Source:**

Compiled from data in FAO (2010). Key findings global forest resources assessment 2010, Food and Agriculture Organization of the United Nations, Rome, Italy. Available at: [www.fao.org/forestry/fra2010](http://www.fao.org/forestry/fra2010).

\* In its latest Forest Resource Assessment 2010 FAO revised upwards its deforestation estimate for the 1990s. In the Forest Resource Assessment 2005 (FAO (2005a). Forest resources assessment 2005, Food and Agriculture Organization of the United Nations, Rome, Italy.), deforestation in the 1990s was estimated at 13 million hectares per year.

\*\* Global and regional totals would not give a correct estimate because of incomplete data sets.

**Box 1: The Forest Transition Theory**

Mather (1992) presents a 'forest transition theory' to explain the growth of planted forests.<sup>17</sup> The study uses Von Thunen's rent theory to explain different stages of forest development. It states that as countries develop, forest land is converted to other land uses, agriculture in particular. The process accelerates as infrastructure improvements open up frontier forest areas and make timber extraction and agriculture economically viable. Over time, as timber becomes scarce, off-farm employment opportunities become available. As the economy develops, a series of policy adjustments are made in response to increased profitability of forest management and forest creation. Consequently, the area of forest cover starts to increase again.

Such a transition has been observed in many developed countries and some developing nations. For example, Vietnam saw its forest cover decline from 43 per cent in 1943 to 20 per cent in 1993 as a result of agricultural expansion and migration into forested areas. Considerable efforts to increase forest cover, including an ambitious reforestation programme were responsible for this reversal in trend. By 2009, forest cover had increased to 39 per cent of land area in the country.

The forest transition theory underscores the central role that informed policy can play in ensuring that forestry services are appropriately valued.

17. Mather, A. (1992). "The forest transition". *Area*, 24, pp. 367-379.



## 2. THE ROLE OF FORESTS IN A GREEN ECONOMY

The multi-functionality of forests places them at the foundation of the green economy, sustaining a wide range of sectors and livelihoods. However, in the prevailing economic paradigm forest assets are still liquidated for limited private and short-term gains. A new paradigm is needed for forests in a green economy.



**Forests contribute optimally to a green economy when, in particular, their full range of private and societal benefits are realized. In this vision of forests, growth in income and employment is driven by public and private investments. These investments reduce carbon emissions, enhance resource efficiency, and prevent the loss of forest-based biodiversity and ecosystem goods and services.**

**Specifically in a green economy:**

**Public and private investments in forests are catalyzed and supported by targeted policy reforms, regulation changes and capacity building.** This development path maintains, enhances and, where necessary, rebuilds forest-based natural capital. Capital formation in a green economy is dependent on healthy and sustainably managed forests. Forests are viewed as a critical economic asset and a source of public and private benefits, especially for poor and marginalized groups.

**Forests are managed and invested in as an asset class and are important factors of production.** Forests serve as inputs in production, producing private low-carbon goods from timber to food. Forests operate as ecological infrastructure, producing public goods such as climate regulation and water-resource protection. Forests are also providers of innovation and insurance services, providing low-carbon solutions and building resilience against climatic change.

**Forests provide many services.** These include services in the manufacturing and service sectors including in traditional industries such as wood processing and paper manufacturing and, service sectors such as tourism, energy, water management. Forest-based products such as second generation

biofuels and other 'bio' solutions ease scarcity. Forests in a green economy also meet critical livelihood needs, of local and some of the most marginalized communities in the world, by providing a stream of energy, raw materials, food, medicinal plants and a cultural identity, amongst others.

**International mechanisms can increase investments in forests.** Good governance will present new opportunities for investments and income sources in and from forests, e.g. through Access and Benefit-sharing and new markets, such as payments for ecosystem services (PES), ensuring greater economic incentives for sustainable management of forests at local, national and international levels. Incentives for investments will emerge from robust and fair international and national systems that ensure forest-related public services, notably carbon regulation, water regulation and biodiversity conservation, are transferred between communities, businesses and nations.

**Forest management hinges critically on an effective and transparent accounting system that measures forest related stocks and flows.** Technological advances and sophisticated tools will enable societies to track and account for the full range of marketed and non-marketed goods and services, including the significant contribution that forests make to the livelihoods of the poor and marginalized.



# 3. INVESTMENTS IN THE FOREST SECTOR

Investment at the scale suggested by the Green Economy Report is unlikely to come from governments alone. Active investment from business is essential, including that from financial institutions and intermediaries.<sup>20</sup> This depends on making forests an attractive investment opportunity.

**The Green Economy Report suggests that an average annual additional investment of US\$ 40 billion is required to halve global deforestation by 2030 and also increase reforestation and afforestation by 140 per cent by 2050 relative to business as usual. Additional investment is required for up-front capacity building and preparatory work, continued implementation of mechanisms that compensate for opportunity costs, reforestation and to make payments for forest protection.**

Today, an approximate US\$ 64 billion is invested annually in the forest sector (calculations as of 2006).<sup>18</sup> Of this, approximately 28 per cent is spent on forest management and the rest is invested in forest product processing and trade. The Green Economy Report suggests that an additional investment of 0.034 per cent of global GDP each year (equivalent to US\$ 40 billion in constant 2010 dollars per year) could raise value added in the forest industry by US\$ 600 billion in 2050. This is 20 per cent more than value added under the business as usual (BAU) scenario which models growth under assumptions that mirror the current economic policy climate. Under the green economy scenario (G2), additional investment is undertaken in reforestation and forest conservation.<sup>19</sup> More than half (54 per cent or US\$ 22 billion of mostly private investment) of this investment is directed to reforestation and 46 per cent (or US\$ 18 billion of mostly public investment) per year is spent on avoiding deforestation to pay forest landholders to conserve forests. Under this scenario, concomitant increases in sustainable productivity-enhancing improvements in agriculture and carefully targeted tree planting ensure that poor farmers are not displaced and there are increased income earning opportunities in rural areas.

The green investment scenario also has positive implications for carbon storage which increases by 28 per cent compared with BAU (See Table 4). Both of these results are consistent with other evidence in the literature. A recent study estimates that targeted investments in forests could generate about 10 million new jobs around the world.<sup>21</sup> Most of this increase in employment occurs via an increase in small and medium sized enterprises. In the forest sector, 80-90 per cent of enterprises are small and medium sized. They currently provide more than 50 per cent of forest sector employment in many countries.<sup>22</sup>

**Table 4: Forest in 2050 under the green investment (G2) and BAU scenarios**

Key forest-sector indicators in 2050	BAU	Green
Natural forest area (Billion hectares)	3.36	3.64
Deforestation rate (Million hectares/year)	14.9	6.66
Planted forest area (Million hectares)	347	850
Total forest area (Billion hectares)	3.71	4.49
Carbon storage in forests (Billion tonnes)	431	502
Gross value added (Trillion US\$)	0.9	1.4

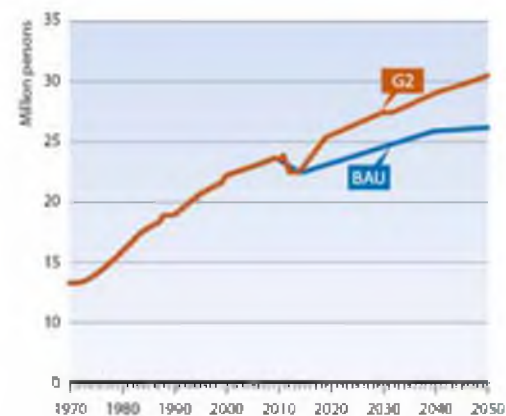
The BAU scenario for the forest sector replicates historical trends from 1970 until 2010 and assumes no fundamental changes in policy or external conditions till 2050. Under BAU, a steady decrease in forest cover is projected (Figures 1 and 2). Carbon storage, together with other forestry related goods and services are expected to decline.

In a green economy, increased and carefully planned investments, contribute to employment growth, rising from 25 million to 30 million worldwide.

**Figure 1: Deforestation reduction under the green economy scenario (G2) and BAU**



**Figure 2: Employment under the green economy scenario (G2) and BAU**



18. Tomaselli, I. (2006). *Brief study on funding and finance for forestry and forest-based sector*, United Nations Forum on Forests.

19. The Green Economy Report presents the results of different investment scenarios. Under the G2 green investment scenario, 2 per cent of global GDP is allocated to green transformation of a range of key sectors including the forest sector.

20. UNEP (2011) *REDDy Set Grow, A briefing for financial institutions, Part 1. Opportunities and roles for financial institutions in forest carbon markets*. United Nations Environment Programme, Financial Initiative, Geneva, Switzerland.

21. Ibid.

22. Molnar, A., Liddle, M., Bracer, C., Khare, A., White, A. and Bull, J. (2007). *Community-based forest enterprises in tropical forest countries: status and potential*. International Tropical Timber Organisation, Rights and Resources Initiative and Forest Trends, Washington, DC, USA.



A woman with dark skin and hair, wearing a colorful patterned shirt and a light-colored skirt with blue floral patterns, stands in a lush green forest. She is holding a basket of small, round, colorful fruits (red, yellow, and green) in her hands. The background is filled with dense green foliage. The text '4. POLICY RECOMMENDATIONS FOR FORESTS IN A GREEN ECONOMY' is overlaid in large, bold, white letters on the right side of the image.

# 4. POLICY RECOMMENDATIONS FOR FORESTS IN A GREEN ECONOMY

**The UNEP strategy on forests outlines four inter-linked building blocks** that can guide countries to realize contributions by forests to a green economy.

- **Knowledge:** Generating and compiling knowledge on multi-functional forests, their use and their cross-sectoral linkages, is key for sustainable management and informed decision-making. Additionally, green accounting systems that fully value inventories and services of forests and forest related benefits are also required along with monitoring, reporting and verification systems that use contemporary information and communication technologies such as Geographic Information Systems and mobile applications.
- **Vision:** Engaging in dialogue to build a participatory vision and agreement on forests, their management, protection and use is critical for maximizing the inter-generational benefits of forests.

- **Enabling conditions:** Adopting fiscal and economic policies help align public and private incentives for conserving, managing and using forests sustainably. These include smart subsidies and taxes that discourage the liquidation of forest resources while encouraging the transition to a forest supported green economy.
- **Finance:** Transitioning towards a green economy requires mobilizing increased public and private investments in forests. Opportunities include agreements on international mechanisms such as PES and Reducing Emissions from Deforestation and Forest Degradation (REDD/REDD+).

These building blocks together form the foundation for realizing the full potential of forests in a green economy. To achieve these, a set of political and technical processes and tools are needed that often reach beyond sectoral ministries and individual countries.

**Table 5: Examples of Green Investment Options for Various Forest Types**

Forest Type	Private Investment*	Public Investment**
Primary forest	Ecotourism development	Create new protected areas
	Private nature reserves	Improve enforcement of protected areas
	Pay landowners to protect watershed	Pay forest landholders to conserve forests Buy out logging concessions
Natural modified forest	Reduced impact logging and other forest management improvements	Incentives for improved forest management
	Certification to sustainable forest management standards	Support establishment of certification systems Control illegal logging
Planted forest	Reforestation and afforestation for production	Incentives for reforestation/afforestation
	Improve management of planted forests	Incentives to improve management Reforestation to protect ecological functions
Agroforestry	Extend the area with agroforestry systems	Incentives to landholders
	Improve management of agroforestry systems	Incentives to improve management and technical assistance

\* Private investment could also include investments made by communities.

\*\* Some of the public investments listed here may also be made by the private sector.



### The role of the international community

The international community has a particularly important role in strengthening forest related governance and creating transparent mechanisms for implementing sustainable forest related agreements. Briefly, the international community can help in the following ways:

- **Agree on an international REDD+ scheme:** This may be the best opportunity to both address the drivers of poor forest management and to raise adequate financial resources to protect forests while ensuring their contribution to a green economy. Stronger governance systems can help governments design specific REDD+ interventions which help in achieving domestic development goals using multi-functional forests as a key tool. Therefore, identifying legal changes, implementing regulatory frameworks, and appropriate transfer and governance mechanisms will be critical.
- **Generate knowledge on forest ecosystem services:** The international community and agencies should invest in the development of databases on forests, forest services and ecosystems and their contributions to other sectors.
- **Stimulate engagement from the commercial financial sector:** Lending, investment and insurance are major channels of private financing for a green economy. Private resources can be directed through tried and tested economic mechanisms and markets which are replicable and scalable (Table 5).
- **Re-invest income from royalties and taxes into the forest sector:** This can provide opportunities for income generation and create regular and valued jobs.<sup>23</sup> International support and advocacy can go a long way in promoting such re-investments.

### The role of government

National governments can ensure that forest based investments have the requisite pre-conditions that encourage entrepreneurship and provide opportunities for 'de-risking' investments and reducing uncertainty. Governments can provide the following policy and technical support:

- **Guarantee adequate returns on risk-adjusted investment** by principally two sets of actions: First, strengthen national accounting, monitoring, risk measurement and verification systems. Specifically, national accounting systems should measure baselines and additions in carbon mitigation at project and national levels. Second, institute straightforward policies that provide guarantees against sovereign risk, support new insurance markets and provide early warnings against price risks and defaults. Countries should also provide mechanisms that hedge against large price volatility while ensuring that mitigation projects are sustainable.
- **Devise transparent and efficient procedures** for gaining international and national approval for forest initiatives, projects and activities: Monitoring and verification capacities as well as ability to negotiate and design mechanisms that assign independent risk measurement and coverage to specialized intermediaries, like insurance companies, are required. Transparent and accessible governance and tax systems that can help administer REDD+ and other forest related investments are also key.
- **Agree on a national vision** for ways and means in which forests can contribute to development while elaborating elements and attributes of a national REDD+ regime: National dialogues that identify areas that undermine a green economy transition and address spending constraints are

23. [www.efi.int/portal/projects/flegt/what\\_is\\_flegt/](http://www.efi.int/portal/projects/flegt/what_is_flegt/)



likely to provide a national roadmap for investing in forests. Clarity on land ownership, benefit sharing mechanisms, acquisition and transfer of forest carbon assets and rights will go a long way in ensuring this process is accessible and acceptable.

- **Employ market-based instruments** to promote green investment and innovation in forests and related sectors: Governments should encourage financial opportunities that allow the provision of credit, microfinance, leases, concessions and other securities in land and forests. Public investment and spending in areas that stimulate the greening of economic sectors should be prioritized. An important area that requires attention is capacity building and training that can catalyze this transition to a green economy.

#### **The role of business and financial institutions**

Forest related opportunities, including markets for forest based mitigation credits provide a rich opportunity for businesses and financial institutions to profit from forests, provided the right incentives are in place. Opportunities for portfolio diversification, national and corporate compliance, corporate social responsibility and political imperatives all imply that there is likely to be continued interest in forests. These also provide businesses, including

financial institutions, an important role in mobilizing investment for protecting forests and realizing their contributions to a green economy and climate change mitigation. Businesses and financial institutions can play the following role in realizing forests' contributions to a green economy:

- Investing in forest projects, forestry development companies, forest funds and acting as financial brokers and intermediaries.
- Providing independent, easily accessible and verifiable risk assessments for forest projects and activities.
- Leveraging resources and providing debt finance for forest related enterprises and individual projects.
- Guaranteeing investment by insuring the forest sector including price risks, natural events risk and sovereign risk within it. Business and financial institutions can also devise creative ways to deal with specific forest-carbon risk such as measurement errors and, systemic and specific risks associated with international agreements and eligibility.
- Applying otherwise conventional financial instruments such as bonds and securities to the forest sector.



# 5. SUCCESS STORIES

Forest policy and finance face competition from other sectors and development goals. It is thus important that decision-makers are provided practical examples of implementation and socio-economic returns. While sustainable management of forests has not 'taken off' (less than 10 per cent of the world's forests are certified for sustainable management), there are many examples of successful policy interventions that show encouraging signs of success.

**Many large cities around the world manage surrounding forests for water services.** In Tokyo, Japan, the Metropolitan Government Bureau of Waterworks manages forests in the upper reaches of the Tama River to increase recharge capacity.<sup>24</sup> The same is true of New York City with its large system of reservoirs in the Catskill Mountains, and of various other South American cities in the Andes.

**Forest related interventions in Costa Rica** have led to economic growth and a dramatic increase in forest cover. In 1995, forest cover in the country was 22 per cent, but by 2010, it had recovered to 51 per cent of the country's land area.<sup>25,26</sup> Recovery of forest cover was the result of targeted interventions and policies such as tax incentives and payment for ecosystem services to land owners.<sup>27</sup>

**India has recently approved a national mission for a Green India.** This initiative aims to increase forest/tree cover on five million hectares of forested and non-forested land and improve the quality of forest cover on another five million hectares. Green India focuses on improving the delivery of ecosystem services, including biodiversity, carbon sequestration and hydrological services. It also aims to increase forest-based incomes for three million forest-dependent families.<sup>28</sup>

#### Box 2. Community Forest Management in Nepal

Community Forest Management is the second largest forest management system in Nepal, where forests cover more than 40 per cent of the land. The Forest Act and Forest Rules recognize Community Forest User Groups as "self-governing autonomous corporate bodies for managing and using community forests", giving a prominent role to community forest management. Such an approach generates employment and income from forest protection, gains from tree felling, log extraction, and non-timber forest products. Community forestry has contributed to restoring forest resources in the country, turning an annual rate of decline in forest cover of 1.9 per cent during the 1990s, into an annual increase of 1.35 per cent over the period 2000 to 2005. The plan includes development of physical infrastructure, the effective use, management and conservation of forests by communities, expanding electricity to rural populations through the use of hydropower, and planning effective transportation via "green roads" for remote village communities.

**The Loess Plateau in China provides an example of socio-economic returns from ecosystem restoration.** This region, roughly an area the size of France and home to more than 50 million people was deeply poverty stricken. The plateau was heavily degraded due to unsustainable farming practices and over-exploited forest resources. A 10-year restoration investment of over US\$ 520 million was able to rejuvenate the land, resulting in a doubling of income for people living within the restoration area. As a result of the restoration project, 2.5 million people were lifted out of poverty and overall employment rates, notably for women, increased significantly. During the second project period, annual per capita grain output increased from 365 to 591kg. Additionally, sediment loads to the Yellow River decreased by 100 million tonnes/year, reducing the risk of flooding and thereby the cost of dam maintenance and damage.<sup>29</sup>

*The Dead Planet, Living Planet - Biodiversity and Ecosystem Restoration for Sustainable Development* report presents internal rates of return on restoration of ecosystem services ranging from 7-79 per cent, providing a good opportunity for public and private investment.<sup>30</sup>

**Two project level examples provide good evidence of socio-economic return of investments in restoration and conservation of forests.** The restoration of natural mangrove forests in Vietnam for US\$ 1.1 million resulted in annual savings of US\$ 7.3 million in sea dyke maintenance. During a subsequent typhoon, the area also suffered significantly less damage than neighboring provinces. In Indonesia, a valuation study of the Leuser National Park estimated that conservation and selective use of forests would provide a higher long-term return (US\$ 9.1-9.5 billion) for the region, compared to more consumptive usage, including continued deforestation (US\$ 7 billion).<sup>31</sup>

**PES and REDD+ provide new avenues for leveraging political attention and private, public and bilateral finance.** Due to the global importance and large financial potential of REDD+ in addressing climate change, it can particularly act as a catalyst for a green transformation in

24. Dudley, N. and S. Stolton (2005). The Role of forest protected areas in supplying water to the world's biggest cities. *The Urban Imperative*. 27–33. In Tryzna, T. (ed.). California Institute of Public Affairs, Sacramento, CA, USA.

25. Food and Agriculture Organization of the United Nations (1997). *State of the world's forests 1997*, Rome, Italy: FAO.

26. Food and Agriculture Organization of the United Nations (2011). *State of the world's forests 2011*. Rome, Italy: FAO.

27. UNEP/GRID-Arendal (2008). *Kick the habit: a UN guide to climate neutrality*, Nairobi, Kenya: UNEP.

28. [www.indiaenvironmentportal.org.in/files/2011-02-23\\_Press\\_Brief\\_GreenIndiaMissionapproval.pdf](http://www.indiaenvironmentportal.org.in/files/2011-02-23_Press_Brief_GreenIndiaMissionapproval.pdf)

29. World Bank (2003). *China-Loess Plateau Watershed Rehabilitation Project. Implementation Completion Report*. Washington, DC, USA.

30. Nellemann, C., E. Corcoran (eds). 2010. *Dead Planet, Living Planet - Biodiversity and Ecosystem Restoration for Sustainable Development. A Rapid Response Assessment*. United Nations Environment Programme, GRID-Arendal. [www.grida.no](http://www.grida.no)

31. TEEB (2010). *The Economics of Ecosystems and Biodiversity Report for Business – Executive Summary*. European Commission: Brussels, Belgium.



forests and related sectors and bridge the transition between business-as-usual and green economy outcomes.

**PES** is a mechanism of voluntary transactions which compensate ecosystem service providers (for instance forest landowners) for providing watershed protection, carbon storage, recreation, biodiversity or other ecosystem services.<sup>32</sup> **At the local level, in Ecuador** the government in the town of Pimampiro pays US \$6-\$12 per hectare per year to a small group of farmers to conserve forest and natural grassland in the area surrounding the town's water source.<sup>33</sup> **The national scheme in Costa Rica**, pays farmers US\$ 64 per hectare per year in five year contracts to conserve biodiverse forests. There are many examples of PES schemes that also factor in social needs to engage poor and marginalized groups. **The Noel Kempff Mercado Climate Action project in Bolivia** developed as a pilot project in 1997 under the Activities Implemented Jointly (AIJ) programme of the UNFCCC was a consortium formed of international and local NGOs, US energy companies and the Bolivian Government. The consortium bought out local timber concession holders and implemented a community development programme in order to extend the Noel Kempff Mercado Park. Through avoided deforestation the project was expected to reduce emissions of up to 3.6 million tonnes of carbon over 30 years.

**REDD+** Whereas REDD recognizes the role of forest degradation and deforestation in limiting GHG emissions and forests as an effective way of sequestering carbon from the atmosphere, REDD+ adds conservation, sustainable management of forests and enhancement of forest carbon stocks to the list of eligible activities.<sup>34</sup> REDD+ has been compared to a multi-layer PES scheme that allows

financial transfers between industrialized countries and developing countries, and also transfers between national level agencies, forest landowners and communities.<sup>35</sup>

**Prospects for REDD+** Unlike the project-based approach of international PES schemes to date, REDD+ may be implemented at both national and sub-national/project level. It is a mechanism that allows financial transfers from developed countries (individually or as a bloc) in return for verified national-level commitments to reduce deforestation and emissions. This is illustrated by Norway's contribution to the Amazon Fund in Brazil, which is conditional on achieving deforestation reduction targets. In 2010, Norway also announced a grant of US\$ 1 billion to Indonesia in return for agreed measures to tackle deforestation and degradation. Under the terms of the agreement, Indonesia has announced a two-year moratorium on new permits to clear natural forests and peatlands.<sup>36</sup>

Similarly, the REDD+ strategy of the United States of America provides an example of pledged REDD+ finance with the clear objective of adopting low-carbon development. The strategy supports host countries' development of REDD+ schemes, in particular those being developed as part of an economy-wide, low-emissions development strategy. It will support developing countries in their efforts to seek climate-friendly, cross-sectoral development opportunities.<sup>37</sup>

REDD+ represents a promising mechanism for leveraging opportunities and resources for low emissions pathways. It is estimated that the mechanism will be able to mobilize tens of billions of US dollars when fully functional. Presently, financial resources committed to preparation activities and bilateral programmes for the mechanism have greatly exceeded what has been provided for PES.

32. See Wunder (2005), cited in TEEB - The Economics of Ecosystems and Biodiversity for National and International Policy Makers (2009).

33. Wunder, S., and Albán, M. (2008). "Decentralized payments for environmental services: The cases of Pimampiro and PROFOR in Ecuador", *Ecological Economics*, Vol. 65, Issue 4, pp. 685-698.

34. As defined by Angelsen (2009). Angelsen also notes that REDD+ means different things to different people. The + sign captures the second part of UNFCCC Decision 2/CR13-11 policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and their role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. Addition of a further + to give REDD++ is being promoted by ICRAF to include agroforestry.

35. Angelsen, A. and Wertz-Kanounnikoff, S. (2008) "What are key design issues for REDD and the criteria for assessing options?" in A. Angelsen (ed.) *Moving ahead with REDD: issues, options and implications*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

36. Richardson, M. (2010). "Indonesia moving to reduce forest loss, warming emissions" *Japan Times*, 21 June. Available at: <http://search.japantimes.co.jp/cgi-bin/ea20100621mr.html>

37. [www.usaid.gov](http://www.usaid.gov)

# 6. CONCLUSION

**Forests contribute substantially to local, national and global economies. They can contribute to a low-carbon, high growth, socially inclusive and equitable, adaptive and low scarcity green economy through their multiple functions and improved management. Forests are also a source for low-carbon raw material and energy, and offer a full range of services for many sectors, human well-being, and climate change mitigation and adaptation.**

**To realize contributions from forests in a green economy, specific enabling conditions are required.** Informed policy-makers recognize that forest management cannot be left entirely to markets, because these are often imperfect or absent. Consequently, to fully realize the benefits of forests in a green economy, governments will need to take an active role. Governments and the international community need to undertake policy reforms to create incentives to maintain and invest in forests and introduce disincentives to modify market signals and associated rent-seeking behavior. Examples of these enabling conditions include national regulations, smart subsidies and incentives, information management,

supportive international markets, legal infrastructure, and conducive trade and aid protocols.

Due to the simultaneous local and global nature of many forest goods and services, nations and entrepreneurs that act upon this paradigm shift in forest stewardship and products stand to gain both in access to initial funding for REDD+, and in procuring a market advantage within the new forest value chains associated with certified sustainable timber. Moving forward, countries and companies that invest in the multi-dimensional goods and services provided by forests will reap benefits both at home and abroad, and speed their transition to a greener economy.

### Box 3. New generation plantations

Intensively managed planted forests are highly productive plantations primarily intended to produce wood and fibre. There are around 25 million hectares of intensively managed planted forests worldwide, representing one-quarter of plantation forests and almost 0.2 per cent of global land area. They generally comprise tropical 'fastwood' plantations of acacia and eucalyptus, as well as temperate conifers.

The New Generation Plantations Project led by WWF collects information and experience from tree plantations in a range of forest landscapes that are compatible with biodiversity conservation and human needs.<sup>38</sup> This project is exploring how forest and plantation management can maintain and enhance ecosystem integrity and forest biodiversity.<sup>39</sup>

New approaches to plantation management can also enhance biodiversity at the stand level.<sup>40</sup> During the 1960s and 1970s, Brazil's Atlantic rainforest, Mata Atlântica, was deforested at an accelerated rate due to logging of valuable tree species for saw milling and subsequently cleared for cattle grazing.

A local pulp mill and tree plantation enterprise which owns around 210,000 hectares in the region, has planted close to 91,000 hectares on land previously used for cattle grazing. More than 100,000 hectares have been set aside for conservation. Trees are planted on plateaus, leaving valleys, river banks, steep slopes, and other areas with special characteristics reserved for environmental preservation. The area reserved for the rainforest is now regenerating naturally, and the most degraded parts are being restored through active planting of some 400 hectares of native species per year. The creation of forest corridors has enhanced connectivity between isolated remnants of the rainforest.

At the end of 2009, over 3,500 hectares of rainforest in the region had been restored.<sup>41</sup> At the landscape level, the plantations have had positive effects by stabilizing land use and reversing gradual forest degradation caused by cattle grazing. They have also made a significant contribution to biodiversity conservation by creating conditions for the protection and regeneration of the Atlantic rainforest.

38. NGPP (2010). Case study 8/ Conserving the Atlantic Rainforest in Brazil. New Generation Plantations Project. <http://newgenerationplantations.com/showcase.html>

39. Neves Silva, L. (2009). Ecosystem integrity and forest plantations. NGPP Ecosystem Integrity Technical Paper, WWF International.

40. Paquette, A. and Messier, C. (2010) The role of plantations in managing the world's forests in the Anthropocene. *Frontiers in Ecology and the Environment*, 8, 27-34

41. NGPP (2010). Case study 8/ Conserving the Atlantic Rainforest in Brazil. New Generation Plantations Project. <http://newgenerationplantations.com/showcase.html>



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# Skógræktarráðstefnan Heimsins græna gull var haldin Hörpunni: Ísland er eftirbátur nágranna sinna – verðmætasköpun í skógrækt hér á landi ómarkviss, að mati sviðsstjóra Þjóðskóga

Skógræktarráðstefnan Heimsins græna gull var haldin í salnum Kaldalóni í Hörpu laugardaginn 22. október sl. Um var að ræða ráðstefnu í tilefni af Alþjóðlegu ári skóga 2011 og var hún með fjölþjóðlegu yfirbragði. Flestir fyrirlesaranna voru komnir frá nágrannalöndum okkar, en eini fulltrúi Íslands var Þröstur Eysteinnsson, sviðsstjóri Þjóðskóga. Fundarstjóri var Aðalsteinn Sigurgeirsson, forstöðumaður Rannsóknarstöðvar skógræktarinnar á Mógilsá, og ræddi hann efni ráðstefnunnar við blaðamann. Fjölþjóðlegt yfirbragð – íslenskur undirtönn

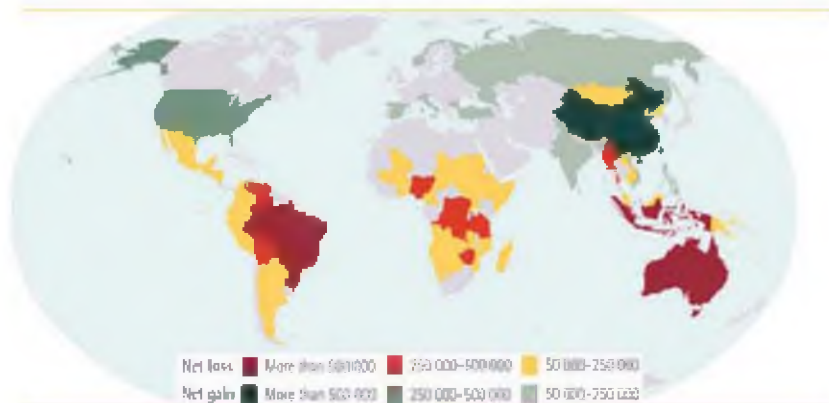
„Árið 2011 er Alþjóðlegt ár skóga hjá Sameinuðu þjóðunum og það eru tildrög ráðstefnunnar,“ segir Aðalsteinn. „Skógræktargeirinn á Íslandi stóð fyrir einni ráðstefnu í vor af þessu tilefni þar sem áhersla var lögð á Ísland og möguleikana hér í skógræktarmálum. Upplegg þessarar ráðstefnu var hins vegar alþjóðlegt og þar með gert ráð fyrir að Ísland yrði í bakgrunninum. Við skipulagninguna var þannig gert ráð fyrir því að reyna að fá einhverja heildarmynd af stöðu skógræktar í heiminum og því var forstöðumaður innan skógræktarsviðs Matvæla- og landbúnaðarstofnunar Sameinuðu þjóðanna, Mette Løyché Wilkie, fengin til að halda erindi um stöðu skógarmála á heimsvísu. Hún er yfirmaður þeirrar deildar sem sér um upplýsingasöfnun frá öllum aðildarríkjunum og gerði hún m.a. grein fyrir því að skógarþekjan héldi áfram að minnka, þó dregið hefði dálítið úr því á síðasta áratug – sérstaklega í hitabeltisskógum Brasilíu, sem skiptir miklu máli.

Jan Heino, formaður samninga- nefndar um lagalega bindandi milliríkjasamning um skóga í Evrópu, var fenginn til að veita svipað yfirlit um stöðu mála í Evrópu og svo vildum við kynna aðstæðum í tveimur nágrannalöndum okkar, menningarlega og landfræðilega, sem þó eru mjög ólík. Annars vegar talaði Monika Stridsman, skógræktarstjóri Svíþjóðar, undir yfyrskriftinni Frelsi með ábyrgð í sænska skógræktargeiranum. Svíþjóð er miklir skógarriki þar sem um 70% landsins eru skógi vaxin og skógariðnaðurinn stendur undir drjúgum hluta þjóðarframleiðslu og útflutningsverðmeta. Hins vegar talaði Aine Ni Dhubháin frá Írlandi, sem er nokkuð nálægt okkur í skógræktarlegu tilliti. Eins og Ísland var Írland skóglaut land fyrir um einni öld, en síðan hafa Írar auknið skógarþekjuna jafnt og þétt – sérstaklega á allra síðustu áratugum. Í máli Aine kom fram að Írar hafi nú náð um 11% skógarþekju en árið 1996, þegar skógarþekjan var um 7%, var stefnan sett á að hún næði 17% árið 2040.“

Þröstur Eysteinnsson var svo síðastur á mælendaskrá og segir Aðalsteinn að það hafi alveg venið við hæfi að ramma hina fjölþjóðlegu umræðu inn með samunburði við íslenskar aðstæður. Þröstur fjallaði þar um íslenska skógrækt í sögulegu ljósi og um leið hina miklu vagnýttu möguleika sem Íslendingar byggju yfir. Þeir væru ríkir af skóglausu landi og ættu að njóta þess að vera í þeirri aðstöðu að geta auknið útbreiðslu skóga til að ná markmiðum í loftslagsmálum.

### Mikil verðmæti tapast í hitabeltinu

Í erindi Mette Wilkie kom fram að áfram er mesta skógarvæðingin í hitabeltinu. Á norðurlöndum, hjá þeim þjóðum þar sem almenn velgæmur er, hafa skógar hins vegar verið að breiða úr sér – sérstaklega í Evrópu. Þá hefur á sumum stöðum í Asíu, sérstaklega Kína, orðið mikil aukning í skógrækt. Heldur hefur dregið úr skógarvæðingu á síðustu tíu árum miðað við tíu árin þar á undan. Árin 1990 til 2000 nam



Skýringarmynd frá Mette Wilkie. Hér sjást nettóbreytingar á skógarþekju á árunum 2005-2010. Miðað er við fjölda hektara á ári. Á myndinni sést að skógarvæðingin er mest í Brasilíu, Indónesíu og Ástralíu, en nýrækt mest í Kína.



Mette Løyché Wilkie.



Jan Heino.



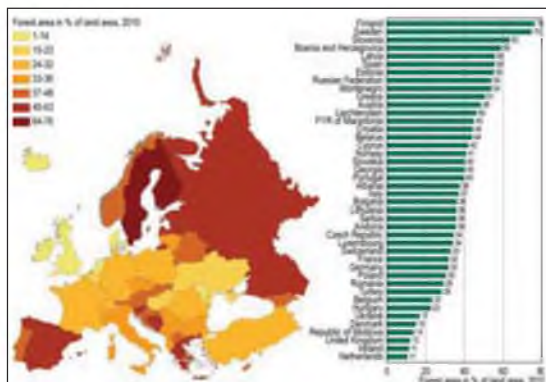
Þröstur Eysteinnsson.

skógarvæðingin 8,3 milljónum hektara á ári, en næstu tíu árin var hún 5,2 milljónir hektara. Aðalsteinn segir skógarvæðinguna í hitabeltinu einnig áhyggjuefni vegna þess að þar séu svæði í hættu sem eru í raun vaggja lífræðilegrar fjölbreytni skóga í heiminum. Skógarirnir sem koma í staðinn, hvort sem um er að ræða á norðurlöndum eða í Kína, geta ekki fyllt það skarð sem eyðing hitabeltisskóganna hefur í för með sér í tilliti lífræðilegrar fjölbreytni. Það er því hættu á því, með eyðingunni regnskóga t.a.m. í Brasilíu og Indónesíu, að við taki vistkerfi sem er mun rýrara og fábreyttara.

Í lok erindis síns birti Mette Wilkie forvitnilega tölfræði sem ætti að einhverju leyti að geta glatt íslenskt áhugafólk um skógrækt, þrátt fyrir erfiðan móttöku á stundum. Þar kom fram að Ísland er í öðru sæti á heimsvísu þegar tekið er tillit til hlutfallslegrar aukningar á nýskógrækt. Einungis Franska Pólýnesia er ofar á þeim lista. Aðalsteinn segir þó ekki mega taka þessa tölfræði af hátiðlega, þar sem Ísland hafi auðvitað verið sérlega skógarlítið land miðað við önnur lönd þegar þessar mælingar hófust fyrir um áratug. Ísland hefur á þessum tíma bætt við sig um 6% skógarþekju.

Sem fyrr segir beindi Jan Heino sjónum eingöngu að Evrópu og gaf hlutfallslegt yfirlit um ýmsar hlíðar skógræktar í álfunni. Þar kemur í ljós að mikill munur er á skógarþekju landa sunnan til miðað við á Norðurlöndunum. Mörg lönd í Suðurlöndum hafa mjög lítila skógarþekju en nágrannalönd Íslands eins og Svíþjóð, Finnland og Noregur eru mikil og rötgróin skógræktarlönd. Ísland sker sig þó úr, með einungis um 0,4% skógarþekju og vermir botnsætið, en Finnland er andstæðan með um 76%. Almenn má segja um Evrópu að þar hafi aukning á skóglendi verið um 800 þúsund hektarar á ári – sl. 20 ár – vegna nýskógræktar eða sjálfgræðsluskóga. Þar af eru um 1.000 til 1.500 hektarar hér á landi.

Í máli Heino kom fram að 70% af nýtingu skóga í Evrópu er nýting á trjáviði. Stærsti hluti þeirra 30% sem eftir standa er nýttur í tengslum við ferðamennsku og náttúrusköpun. Eignarhaldi skóga í Evrópu er almenn nokkuð jafnt skipt milli ríkis og einkaaðila. Íslenskir skógar eru meðal þeirra sem eru hvað mest í einkaeign.



Á þessari skýringarmynd frá Jan Heino má sjá hlutfall skógarþekju í löndum Evrópu. Ísland er ekki á listanum en væri þar langneðst með um 0,4%.

440 663 607 709

### Framtíðarsýn evrópskra skóga er fjögur

Heino er sem fyrr segir formaður samninganeftdar um lagalega bindandi milliríkjasamning um skóga í Evrópu. Nokkur tími fór því í að greina frá störfum þessarar nefndar, en unnið er út frá yfyrskriftinni Evrópskir skógar 2020. Þar er lagt út af þeirri framtíðarsýn að evrópskir skógar verði mikilvægir til framleiðni og fjölnýtingu og leggi sinn skerf af mörkuum til sjálfbærrar þróunar samfélaga; til velfarnaðar fyrir mannfolk og haðgröun í heiminum. Helstu markmiðin sem eiga að nást með þessum samningi eru þrjú: sjálfbær nýting skóga, að viðhalda og auka skógarauðindis og tryggja að skógar standist loftslagsbreytingar og svo á að auka þanþoll skóga gagnvart náttúruháttum og vernda gagnvart ýmsum ögnum.

Aðalsteinn segir að þessi sameiginlega skógaáætlan hafi verið í undirbúningi í um 20 ár og hefur Ísland tekið fullan þátt í því starfi. Gagnvart Íslandi er kannski mikilvægast í markmiðum nefndarinnar að stórauka hlutverk skóga í mótvægisáðgerðum gegn loftslagsbreytingum. Stefnir er

618 663 787 709

### Gagnrýni á neikvæðni og afurthald

Þröstur Eysteinnsson rakti fremur dapurlega sögu skóga á Íslandi í stuttu en skýru máli. Hann gerði grein fyrir því hvernig stórvaxnir skógar, ríkulegur botngróður og viðátumikið kjarr hefðu hoptað fyrir kröfum manna um beitarlund og byggingartímber, vegna kolagerðar og smíða á verkfærum. Þá sötti búfé fæðu sína eða meira í skóga og fram undir 1950 var skógvíður notaður til að elda mat. Skógarirnir gátu því ekki endurnýjað sig. Jarðvegsof og eyðimerkurmyndun fylgdu í kjölfarið. Hann sagði Ísland hafa verið í sömu stöðu og nágranna þess, en endurheimt skóga síðan hefði gengið mun hægar á Íslandi.

Erindi Þrastar var býsna beinskýtt gagnrýni á neikvætt viðhorf Íslendinga gagnvart skógrækt. Framan af 20. öld hefði almenn fátækt verið ástæða fyrir hegðingunni í skógrækt, en síðan hefði málið snúist um að reyna að sannfæra Íslendinga um að tré gætu vaxið hér á landi yfir höfuð – og enn eimdi eftir af þeirri hugsun hér á landi. Máli sínu til stuðnings, og því að skógrækt væri að ýmsu leyti ákjósan-

795 183 973 520

795 520 973 770

### Íslandi ríkt af skóglausu landi

795 786 973 854

795 853 973 984

# Stórfelldur markaður fyrir viðarmassa

**Víða um heim vex nú eftirspurn eftir lífmassa til orku- og efnaframléiðslu. Þetta á meðal annars rætur í þeirri ákvörðun margra iðnvæðra þjóða að auka hlut innlendra og sjálfbærra orkugjafa í heildarorkunotkun. Þannig hafa bæði ESB og Bandaríki Norður-Ameríku sett sér það markmið að allt að 20% orku í samgöngum og flutningum komi frá endurnýjanlegum orkugjöfum árið 2020.**

Aætlað er að stórauka orkuframléiðslu með lífmassa frá landbúnaði og skógrækt. Nú sem stendur er líf-eldsneyti (t.d. etanól og olía) fyrir vélar og farartæki einkum framléitt úr máis og reppju, sem ræktað er á frjósömu akurlendi. Þetta hefur verið gagnrýnt á þeim forsendum að orkuframléiðslan keppi um land við matvælaframléiðsluna. Margir telja æskilegt að framléiða líf-eldsneyti fremur úr skógarafurðum og þá gjarna úr skógi á rýru landi. Þrátt fyrir þetta er þróunin víða sú að rækta hraðvaxta tré og runna á góðu landi þar sem auðvelt er að beita vélum við ræktun og uppskeru. Sé ætlunin að fá hátt hlutfall af víði í lífmassanum eru gjarna notaðar aspir í tempraða beltinu en tröllatré (Eucalyptus) þar sem heitara er. Slík ræktun getur gefið af sér borðvið auk lífmassans.

Skógrækt sem fyrst og fremst miðar að lífmassaframléiðslu, og mætti nefna akurskógrækt, hefur mun styttri ræktunarlötu en skógrækt sem ætluð er til timburframléiðslu. Algeng ræktun varir í 3-20 ár. Ræktun í 3-8 ár nefnist á ensku short rotation coppice (SRC) og hefur verið nefnd teinungarækt, og ef ræktunarlötu er 8-20 ár er skógræktin nefnd short rotation forestry (SRF), sem gæti kallast skógrækt með stutta lötu eða skammloftuskógrækt. Víðiræktun í Svíþjóð og á Englandi er dæmigerð teinungarækt þar sem venjulega er uppskorið á þriggja ára fresti og uppskeran kurluð í heilu lagi.

Trjákenndur lífmassi er einnig framléiddur úr öðrum plöntum en trjám. Víða er korn- eða grashálmur nýttur til framléiðslunnar. Sem dæmi um orkugrös má nefna fillgras (Miscanthus) og „switchgrass“ (Panicum virgatum). Það fer eftir ýmsu hvað hentugast er að rækta. Má þar nefna gerð ræktunarlands, einasamsetningu lífmassans sem á að framléiða, hvaða orkuefni á að framléiða og svo hvaða framléiðsluáferðir er hentugast að nota. Stundum er framléiðslan brennd beint, stundum er hún gerjuð í etanól og svo er einnig hægt að framléiða viðarkol, olíu, gas o.fl.

Því fylgja ýmsir kostir að nota trjágröður til þess að framléiða lífmassa. Stofnorkostnaður kann að vera svipaður og við aðra ræktun, en ræktunin sjálf er nánast viðhaldsfrí. Trén og runnamir endurnýja skógin með rötur- eða stofnsprotum eftir að uppskorið er og því sparast plöntunarkostnaður. Tekjur skila sér þó síðar en þegar einærar eða vetraræinærar tegundir eru ræktaðar. Fjölær orkugrös gefa heldur ekki fulla uppskeru fyrr en nokkrum árum eftir sáningu eða útplöntun.

Það er á margan hátt auðveldara og ódýrara að stofna til lífmassaskógræktar á Íslandi en í grannlöndum okkar. Má þar nefna að ekki þarf að girða fyrir nagdýr og hjartardýr, en þau dýr eru mikill þrándur í Götu ræktunar lauffrjáa víða um heim. Einnig er illgresisvandi mun minni hér en víðast hvar annars staðar.

**Hver er staðan hér á landi?**  
Skemmt er frá því að segja að skógrækt eins og hér hefur verið lýst er ekki hafin hér á landi, né heldur ræktun annarra orkuplantna að undanskildri ræktun á reppju í litlum mæli. Aðstæður til ræktunar á orkuskógi eru samt sem áður að mörgu leyti góðar. Fyrst og fremst má þar nefna að landrými er töluvert, og ekki þarf að nýta allt land til fðurframléiðslu. Þorbergur Hjalti Jónsson og Björn Traustason á Mógilsá hafa gerð



Tæplega tvítugur skógur í Biskupstungum. Á mörgum bújörðum er land sem taka má undir skógrækt.



Með trjákybótum má auka vaxtarhraða. Myndin sýnir ösp á öðru ári eftir gróðursetningu.

úttekt á stærð lands sem hægt væri að nýta til iðnvíðaræktunar og er í minna en hundrað kílómetra fjarlægð frá núverandi og áformuðum kísiljárnverksmiðjum á Suður- og Vesturlandi. Þessar tölur eru sem hér segir. Framræst myri er 139 þúsund hektarar, graslendi, mói og hálfgróið og lítt gróið land er 128 þúsund ha að flatarmáli og tún eru 67 þúsund ha. Samtals eru því 334 þúsund hektarar á svæðinu hæfir til ræktunarinnar. Að sjálfsgöðu verður allt þetta land ekki nýtt á þennan hátt, t.d. má strax draga túnastærðina frá þessari tölu. Ekki er heldur auðvelt að átta sig á hve áfjádír landeigendur verða í að hefja ræktun iðnvíðar. Ef fjórðungur af óræktuðu landi yrði nýttur til iðnvíðarskógræktar, mundi það nema um 67 þúsund ha, sem er jafn stórt núverandi ræktarlandi á þessu svæði.

**Þörf fyrir iðnvíð**  
Hver er þá þörfin fyrir iðnvíð? Miðað við lágmarks viðarþörf verksmiðja á Grundartanga, í Helguvík og við Þorlákshöfn þyrfti að rækta skóg á

40 þúsund ha. Ef víðurinn ætti að koma í stað innfluttra kola og koks þyrfti skóg á 255 þúsund ha, sem þýddi í raun að allt óræktað land á Suður- og Vesturlandi yrði að taka undir skógrækt.

Þá má spyrja: Af hverju að binda sig við innan við 100 km fjarlægð frá verksmiðjunum? Skýringin á þeirri tölu er að flutningskostnaður frá skógi til verksmiðju yrði líklega viðráðanlegur innan þessara marka. Víður og viðarkurl er dýrt í flutningi. Verksmiðjan á Grundartanga flytur því miknið inn af kolum og koks, sem mun hagkvæmara er að flytja en gert var í Skorradal á síðasta ári. Ef framléidd væru viðarkol úr skógarafurðum utan þess svæðis sem áður er rætt um, væri hægt að stækka svæði til ræktunar á iðnvíði töluvert, vegna þess að viðarkolin eru hagkvæmari í flutningi. Flutningur með skipum gæti líka reynst ódýrari en landflutningur.

**Heppilegar trjategundir**  
Til framléiðslu á iðnvíði er hægt að nota margar tegundir barr- og lauffrjáa. Sjálfsagt er að nýta grísjunarvíð úr greni- og furuskógum, eins og gert var í Skorradal á síðasta ári. Ef ekki þarf að albarka víðinn þarf ekki að gera miklar kröfur um að trén séu beinvaxin. Þá mætti nota víði, gráelri, birki og reynvíð. Sólarkísilframléiðsla gerir hins vegar kröfu um að víðurinn sé albarkaður og til þess þarf beina boli, og þeir fást aðeins með gæðaræktun á barrtrjám eða ösp. Hér á landi er alaskaösp sú tegund sem líklega hentar best í iðnvíðarframléiðslu. Hún vex hratt á góðu landi, er auðveld í fjölgun og lítil afföll verða á gróðursetum plöntum. En klónavalið þarf að vanda.

**Asparrannsóknir og kynbætur**  
Verulegir fjármunir og mikil vinna hefur verið lögð í klónatílaunir og kynbætur á alaskaösp hér á landi. Í tengslum við iðnvíðarverkefni sem hófst í lok níunda áratugarins voru lagðar út tílaunir um land allt

á vegum Rannsóknastöðvar skógræktar á Mógilsá. (Um þessar tilraunir má lesa í grein eftir Aðalstein Sigurgeirsson í Skógræktarrítinu 2001.) Kynbætur sem byggðu á því að víxla saman klónum hófst þá einnig, en í kjölfar þess að asparryð fannst hér árið 1999 var hrunnið af stað stóru kynbótaverkefni sem enn stendur yfir. Árið 2007 voru svo framléiddir tegundablendingar af ösp, sem vonir standa til að vaxi enn hraðar en alaskaösp. Úr öllum þessum efnivíði er nú verið að velja efmílega klóna til þróunar. Tilraunareitir sem lagðir voru út í skóginum í Þrándarholti (Sandlækjarmýri) í Gnúpsverjahreppi í byrjun tíunda áratugarins veita nú verðmætar upplýsingar fyrir iðnvíðarverkefnið, sem unnið er í samvinnu Rannsóknastöðvarinnar á Mógilsá og járnblendiverksmiðju Elkem á Grundartanga. Mælingar og útreikningar sýna að reikna má með að 20 ára skógur sé tilbúinn til sölu sem iðnvíður fyrir kísilíðnaðinn. Viðarmagn í slíkum skógi gæti verið á annað hundrað rúmmetrar á hektara. Í framtíðinni væri hægt að auka viðarmagnið eða stytta ræktunarlötu með notkun vaxtarmeiri klóna. (Sjá nánar í grein um ösp á Íslandi eftir Halldór Sverrisson, Fræðingur landbúnaðarins 2011, í greinasafni á landbunadur.is.)

**Fjölþætt notagildi**  
Þótt hér hafi mest verið rætt um

markað fyrir iðnvíð, er líklegt að eftirspurn verði eftir víði til margra annarra hluta. Viðarkurl verður hér eftir sem hingað til eftirsótt sem undirburður undir búfé og sem efni í stíga. Á köldum svæðum er hægt að nota viðarkurl til húshitunar, en það er nú þegar gert á Hallormsstað. Veitingastaðir sækjast eftir víði í bökunarfarna og ef trjáboli ná vissum gildleika nýttast þeir sem smíðaviður, girðingaeefni o.fl. Einnig má nefna að á bændabýlum verður hægt að skipuleggja skógræktina þannig að skógininn skýli búfé og ræktunarlötu. Í lok 15-20 ára ræktunarlötu verða því margir möguleikar á að koma framléiðslunni í verð og ef þá er hagkvæmt að nota landið til annars, er hægt vandi að fjarlægja stubba og rætur með þar til gerðum búnaði og kurla sem eldivíð eða til að nota í undirburð eða stigagerð.

Ekki má heldur gleyma því að kolefnisbinding er mikil í hraðvaxta skógi. Ef til vill verða kolefniskvótar verðmæt verslunarvara í framtíðinni og jafnvel þótt víðurinn væri nýttur til brennslu, er þar um kolefnishlutlaust eldsneyti að ræða.

*Haldór Sverrisson, Þorbergur Hjalti Jónsson og Aðalsteinn Sigurgeirsson*  
Höfundar eru starfsmenn Landbúnaðarháskóla Íslands og Rannsóknastöðvar Skógræktar ríkisins á Mógilsá.

**Glugga- og hurðasmíði**

Smíðum glugga, hurðir og opnanleg fög í þeim stærðum og gerðum sem henta þér.

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**Smiðaðþjónusta**

**BÁRUJÁRN,**  
VEGGKLENNINGAR  
OG FLASNINGAR

**GIPSSTOÐIR**

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