Liechtenstein's Submission on Reference Levels for Forest Management under the Kyoto Protocol

Reference level

Liechtenstein proposes national reference levels for Forest management for the commitment period 2013-2020 of:

Table 1: Reference Level Liechtenstein

Gg CO_2y^{-1}	
+ 1.30	Calculated reference level, wood harvesting
- 2.40	Annual HWP-production from wood harvested in the reporting country (domestic harvest) including existing pools since 1900
+ 1.20	Stock change of organic soli carbon
= 0.10	**Liechtenstein reference level 2013-2020**

The submission is structured in accordance with Annex II of the draft decision on LULUCF.

General description

Ad 4) Provide a general description of the construction of the forest management reference level consistent with footnote 1 of paragraph 4 of this decision

Report Basics

With regard to the small size of Liechtenstein and the technical and administrative proximity of forestry management to Switzerland the model itself, many parameters, the forest inventory methods and the descriptions are the same like in Switzerland.

The study is based on the last finished inventories of the forests of the Principality of Liechtenstein (1986, 1998) in the same manner as the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) in the Swiss National Forest Inventory has done it in Switzerland. The Inventory of 2010 is not yet complete.

The study itself is dated from 2006. It uses material flow models for forest and timber industry and a model for the material and energy substitution, similar as developed for the CO2 budget of Switzerland. The model was adjusted to the situation of the Principality of Liechtenstein. Consequently the estimation of the reference level of Liechtenstein is based on nearly the same model and parameters like in Switzerland.
In 2006 a study about optimization of forest growth, timber harvesting and wood utilization with respect to CO2 sinks and CO2-substitution effect was given in order (see *HOFER et. al., 2006)*. The aim of this study was to find out the best forest management strategy for Liechtenstein in regard to CO2 reduction effect until 2090. The model established in this study, which uses data of the latest great forest inventories, is basis of the determination of the reference level of Liechtenstein. In 2011 a second study to propose the reference level based on the same model, with some changes in respect to the shorter time period of forecast, was made.

The scenarios accounting for the forest are based on the data of the national forest inventories and were calculated with the forest management model MASSIMO and the soil model

YASSO. The timber industry calculations are based on the adapted model Xyloikos with the software program SIMBOX. The bases were long time series of wood consumption, as well as current studies on wood consumption in Switzerland. The substitution effects of the use of wood instead of alternative materials were determined on the basis of ecological databases. It was also developed a model to define the issues of emissions to and from abroad from Liechtenstein. In the following calculations only stock-changes of Liechtenstein's wood are taken into account, but not substitution-effects.
After four calculated scenarios in the study 2006 a scenario between the so called *Optimized increment* and the *Baseline* was chosen as basis for the calculations for the reference level. In this scenario the forest is managed with a view to sustainable high growth rates.

The scenarios were built on:
• Data of the national forest inventory and the resulting models developed
• Current consumption figures of wood products and their development potential (population development, prospective construction works …)
• Model calculations of material and carbon fluxes as well as pools in the civilizational cycle
• Calculations of the effects of material substitution at home and abroad, in various use-areas of construction, other timber applications and energy

The Forest (Soil) model

MASSIMO (Management Scenario Simulation Model) targets are the development of the forest structure and the yield of living and dead tree biomass. The model was derived empirically from the data of the latest national forest inventories in 1986 and 1998. It is a stochastic model in which the probabilities are defined for events. The model works dynamic in ten year increments. After each decade the model has updated the effect sizes (stock ratios) for different functions. The final state is not directly from an initial state from. Main components are the rejuvenation, natural regeneration, forest growth, mortality and harvesting.

Outcomes of **YASSO (**Soil-Carbon-Cycle Model) are the degradation rates in dependence on climatic factors and the organic material entry in the soil. It models the transition of the entries of leaves, needles and fine roots, branches and coarse roots, of standing timber in soluble components in cellulose, lignin, humus and finally in emissions of CO_2.

For more details on the model, please see original document of the references list *(HOFER et. al., 2006)*.

Ad 5) Provide a description on how each element contained in footnote 1 in paragraph 4 of this decision was taken into account in the construction of the forest management reference level

Table 2: Consistence to footnote 1 in paragraph 4 and in reference to the document of Switzerland, which took the same model basis for calculation

(a) Removals or emissions from forest management as shown in greenhouse gas inventories and relevant historical data;	Liechtenstein's reference level is based on the latest national forest investigations 1986 and 1998. - MASSIMO is the model that was used to estimate changes in living biomass and the relevant CO2-gains and losses for the past as well as projections for the future as

	influenced by forest management and other factors. - Linked to MASSIMO is the model YASSO, which was used to calculate the changes in soil carbon stocks as influenced by factors such as the trees and climatic conditions.
(b) Age-class structure;	The model considers age-class structure for the respective calculation of gains and losses of living biomass. Data were derived from the last National Forest Inventories.
(c) Forest management activities already undertaken;	The model is calculated based on historical data of the National Forest Inventories, which comprise management activities.
(d) Projected forest management activities;	The model based the "Optimized increment" and "Baseline" Scenarios of Liechtenstein. As Switzerland's Wood Policy is very near to the one of Liechtenstein and therefore some of the Swiss assumptions where transferred.
(e) Continuity with the treatment of forest management in the first commitment period	The model does not diverge from this, because the law about forestry management is up to date in Liechtenstein. The forestry management of Liechtenstein is based on targets to maintain the biodiversity, productivity, regeneration capacity of forests.
(f) The need to exclude removals in accordance with decision 16/CMP.1, paragraph 1 (h)	No accurate factoring-out is yet possible
(g) und (h)	These points are dealt with item 9 (f and g)

Pools and Gases

Ad 6) Identify pools and gases which have been included in the reference level and explain the reasons for omitting a pool from the reference level construction.

Projections with the model MASSIMO consider changes in carbon stocks of living biomass. The estimation of living biomass depends in the model on species specific stand structure, stand growth and age class structure.

Pools

The pools considered in deriving the reference level are consistent with the pools currently reported under the UNFCCC. It therefore includes estimates for the pools above-ground biomass, below-ground biomass and dead wood. Liechtenstein used a conservative approach and assumed the dead wood pool for the construction of the reference level as high as in the recent past.

As Liechtenstein has nearly the same economic, geographic and topographic situation like Switzerland, the pools (e.g. litter, below ground living biomass) included in the construction of Liechtenstein's Reference Level follow the same basic parameters. The standing stock of the Principality of Liechtenstein is specified due to the National Forest Inventory with 1553

million m3 (stemwood with bark). This represents a living tree biomass of 0,582 million tonnes C, which corresponds to 17'130 kg C / inhabitant. At the same time the amount of carbon specified in and on the ground is about 15'185 kg C/inhabitant. The C-content in the standing stock is thus greater than that in and on the forest floor. The values of today's wood flows and stock were determined by analogy to the Swiss investigation. They were determined on the basis of statistics of consumption trends from 1900 to 2000. By simulating the development of consumption over the period of time the stock of the different product groups were calculated in the civilisational cycle. The calculated amounts were compared with estimates of current stocks. A relatively high correlation could be determined.

Gases
The emissions from forest fires were not taken into account, because of the small area of Liechtenstein and the rarity of such events. A study in Switzerland showed that the values for omitted greenhouse gas emissions are negligible for the reference level in our region (see ANDERSON et. al., 2011).

Ad 7) Explain consistency between the pools included in the reference level

It was assumed that the pools are consistent with the pools currently reported under the UNFCCC. The estimate methods, conversion factors used, biomass functions and timber functions are the same for the reference level and for reporting on forest management during the commitment period.

Approaches, methods and models used

Ad 8) Provide a description of approaches, methods and models, including assumptions used in the construction of the forest management reference level, referring, where relevant, to the most recently submitted National Inventory Report.

Please see point 4) for a general description of the used wood-soil-model.

MASSIMO is a stochastic empirical single tree forest management scenario model, which was derived using data from the National Forest Inventories.

The major model components are:
- Single tree growth: based on a single tree model
- Wood harvesting: derived from a baseline scenario and rotation lengths
- Mortality rates: based on data on all management activities from the National Forest inventories
- Natural regeneration: based on information extracted from a database containing regeneration plots from the National Forest Inventories

All model components as well as in-growth and mortality rates were empirically derived from National Forest Inventory data.

YASSO simulates the dynamics of different types of soil carbon depending on the type and chemical composition of litter and underground biomass as well as climatic conditions. The model computes the sequestered carbon as affected by human disturbances, i.e. mainly from harvesting, or as impacted by natural disturbances, i.e. mainly storms causing.

As Liechtenstein uses the same models like Switzerland (MASSIMO, YASSO) and because of nearly the same economic and topographic situation the pools (e.g. litter, below ground living biomass) included in the construction of Liechtenstein`s Reference Level are the same or follow the same basis.

For more detailed information on the model please see the referenced German document (HOFER et. al., 2006).

Calculation of Harvested Wood Products (HWPs)

The used model for material fluxes in the timber industry covers all uses of wood in the civilizational cycle.

The inputs to the system set up as follows:
- Forest & Timber (ordinary and industrial wood) from the Principality of Liechtenstein.
- Fuel wood (including energy used chips and particles) from the Principality of Liechtenstein.
- imports of the wood industry producing furniture and prefabricated houses;
- Imports of pulp and paper were set to zero

The output flows include:
- Exports of Forest Products
- Exhausted gas from the combustion of wood as a main output volume from the system. Solid residues (ashes) are due to their low significance (2%) not included.
- Waste wood, which is not burned in wood firings leaves the Principality of Liechtenstein for use abroad or for incineration
- The Export of recycled paper is constantly charged with a collection rate of 64%.

The system is consumption-driven. The consumption rates used were taken from a Swiss study (Tavern et al. 2007) and adapted to the number of inhabitants of Liechtenstein.

Ad 9) Provide description of how each of the following elements were considered or treated in the construction of the forest management reference level, taking into account the principles in decision 16/CMP.1

(a) Area under forest management;

All forests of Liechtenstein are under forest management.

Liechtenstein adopted its forest definition (and its LULUCF methodologies) from Switzerland.
New definition of forest for Liechtenstein (OEP 2007):
For activities under Article 3, paragraphs 3 and 4 of the Kyoto Protocol, the Marrakech Accords (in the annex to decision 16/CMP.1) list the definitions to be specified by Parties. For forest, Liechtenstein chooses the following definition:
• minimum area of land: 0.0625 hectares (with a minimum width of 25 m)
• minimum crown cover: 20 per cent

• minimum height of the dominant trees: 3 m (dominant trees must have the potential to reach 3 m at maturity in situ)

(b) Emissions and removals from forest management and the relationship between forest management and forest land remaining forest land as shown in GHG inventories and relevant historical data, including information provided under Article 3.3., and, if applicable, Article 3.4 forest management of the Kyoto Protocol and under forest land remaining forest land under the Convention;

The emissions and removals from forest management under the Kyoto Protocol and from Forest Land remaining Forest Land under the UNFCCC are like in Switzerland almost nearly equal, because of the same methodology and nearly the same situation.

Table 3: Liechtenstein's CO2 equivalent emissions/removals [Gg] of the source category 5 LULUCF 1990-2008. Positive values refer to emissions; negative values refer to removals from the atmosphere.

LULUCF	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
	Gg CO_2									
Increase of living biomass in forest	-68.7	-68.8	-68.9	-69.0	-69.1	-69.2	-69.2	-70.3	-70.3	-70.3
Decrease of living biomass in forest	50.3	50.4	50.5	50.5	50.6	50.6	50.7	51.0	51.0	51.0
Land-use change and soil	10.2	10.2	10.2	10.1	10.1	10.1	10.1	14.4	14.3	14.3
Sector 5 LULUCF (total)	**-8.22**	**-8.25**	**-8.29**	**-8.32**	**-8.36**	**-8.39**	**-8.43**	**-4.95**	**-4.94**	**-4.93**

LULUCF	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	Gg CO2								
Increase of living biomass in forest	-70.3	-70.3	-70.3	-69.6	-69.6	-69.7	-69.7	-69.8	-69.8
Decrease of living biomass in forest	51.0	51.0	51.0	50.8	50.9	50.9	51.0	51.0	51.1
Land-use change and soil	14.3	14.3	14.3	12.4	12.4	12.4	12.4	12.4	12.4
Sector 5 LULUCF (total)	**-4.92**	**-4.91**	**-4.91**	**-6.29**	**-6.31**	**-6.33**	**-6.35**	**-6.37**	**-6.39**

(c) Forest characteristics including age class structure, increments, rotation length, and other relevant information, including information on forest management activities under .business as usual.;

In consequence the use of the model MASSIMO based on data from the latest forest inventories in Liechtenstein and the use of the named forest characteristics based on the model Business As Usual are guaranteed.
Further information on the latest Forest Inventory of Liechtenstein can be found under http://www.llv.li/pdf-llv-awnl-landeswaldinvent.pdf (language German).

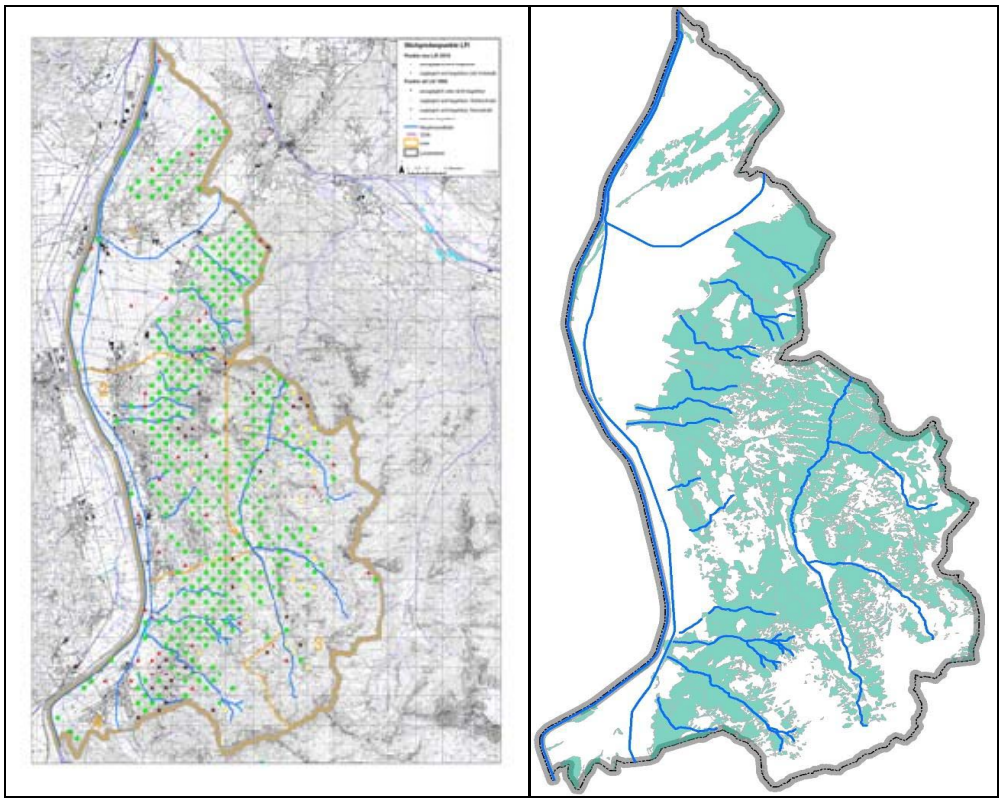

Figure 1: Sample Points of the field survey of the current National Forest Inventory (2010) and forest area of Liechtenstein

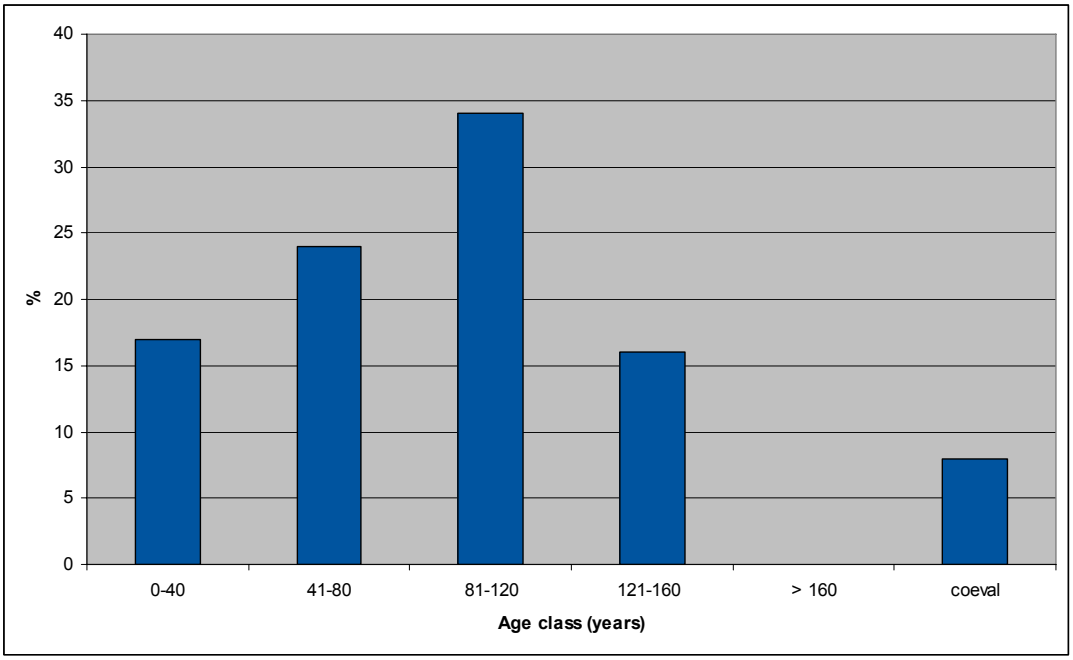

Figure 2: Age class distribution in Liechtenstein according to trees sampled during the second National Forest Inventory (1998)

(d) Historical and assumed harvesting rates;

Because in Liechtenstein a long tradition of cooperation between forest managers and the Office of Forest, Nature and Land Management exists, there are detailed statistical data about harvesting rates over a long period. This data are the basic assumed harvesting rates used in the model for the estimation of the reference level. As a consequence form the century-long

consistent forest policy forest area and the growing stock has increased, the latter are actually on high level.

Table 4: Historical harvesting rates in Liechtenstein

	Total	timber			pulp wood			energy wood			
		Total	conifer wood	decidous wood	Total	conifer wood	decidous wood	Total	conifer wood	decidous wood	wood chips
year	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
1986	18'143	10'732	10'104	628	2'071	2'071	-	5'340	2'203	3'137	*
1987	13'194	8'772	8'543	229	262	125	137	4'160	1'845	2'315	*
1988	13'843	9'504	9'424	80	790	760	30	3'549	1'588	1'961	*
1989	13'479	9'059	8'765	294	1'454	907	547	2'966	1'125	1'841	*
1990	20'024	14'999	14'589	410	670	584	86	4'355	2'116	2'239	*
1991	10'333	7'163	7'108	55	157	140	17	3'013	1'179	1'834	*
1992	16'853	12'066	11'437	629	412	44	368	4'375	1'988	2'387	*
1993	14'759	10'571	9'849	722	243	106	137	3'945	1'706	2'239	*
1994	26'315	20'512	19'200	1'312	823	626	197	4'980	2'556	2'424	*
1995	18'087	13'441	11'759	1'682	970	497	473	3'676	1'666	2'010	*
1996	12'970	9'178	8'771	407	382	382	-	3'410	1'268	2'142	*
1997	19'527	14'871	14'474	397	513	488	25	4'143	2'192	1'951	*
1998	14'537	9'216	7'552	1'664	687	306	381	4'634	1'819	2'815	*
1999	13'538	7'580	7'027	553	872	656	216	5'086	2'037	3'049	*
2000	28'683	19'033	18'524	509	728	371	357	8'922	5'199	3'723	*
2001	14'477	7'305	7'018	287	1'713	1'035	678	5'459	1'947	3'512	*
2002	14'755	7'124	6'876	248	1'922	1'582	340	5'709	2'301	3'408	*
2003	17'016	8'562	7'888	674	904	580	324	7'550	1'455	3'396	2'699
2004	18'169	8'895	8'152	743	1'017	909	108	8'257	1'949	3'562	2'746
2005	18'038	8'166	7'938	228	731	731	-	9'141	1'379	4'205	3'557
2006	20'776	9'407	8'898	509	928	555	373	10'441	1'725	3'978	4'738
2007	26'099	11'313	10'768	545	875	875	-	13'911	1'429	3'726	8'756
2008	27'217	11'544	11'141	403	1'632	1'481	151	14'041	1'368	3'755	8'918
2009	25'364	9'745	9'256	489	222	222	-	15'397	1'632	4'215	9'550

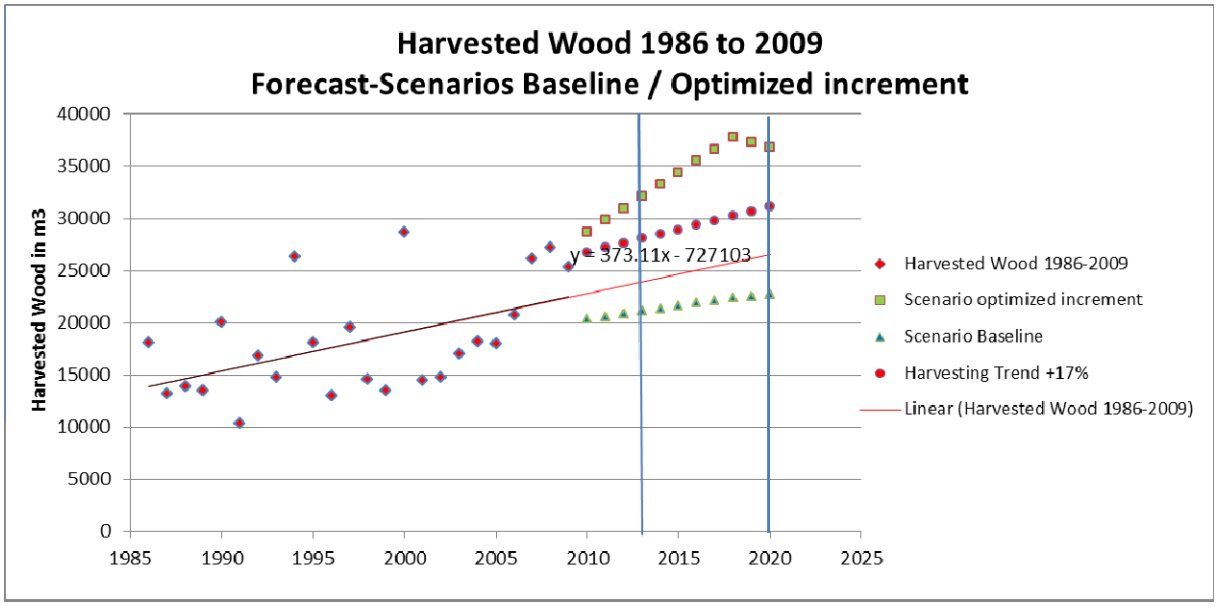

Figure 3: Development of Harvest 1986 until 2009; forecast based on scenarios; References: Hofer et al, 2006

Trendline of harvests 1986 to 2009 show an important increase of almost 400m^3/year. Knowing the fact, that forest statistics show often not the real amount of harvests, the trendline should be about 17% higher than calculated. For the future it can be assumed, that harvest will be between the value of the two scenarios. The harvesting level of the scenario "Opitmized increment" follows as far as possible the produced increment in the forest.

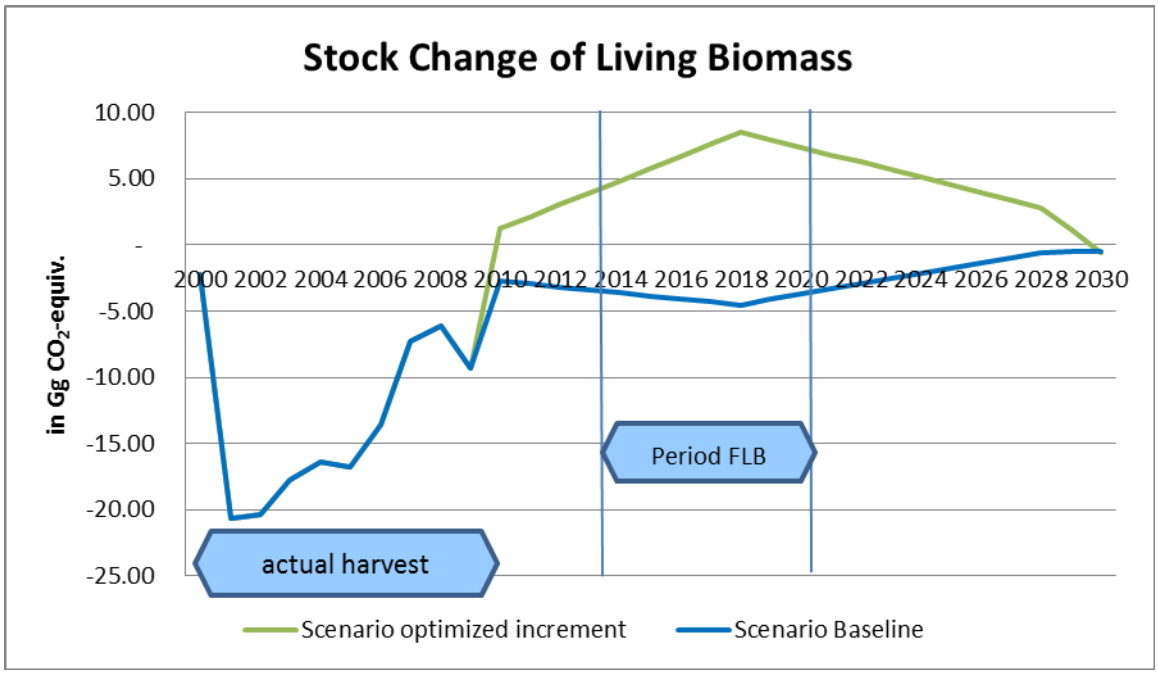

Figure 4: Stock change of living Biomass; References: Hofer et al, 2006

The illustrations show until 2009 values based on the realised harvest amounts. It can be assumed, that harvests up from 2010 will be between the "Optimized increment" and the "Baseline"-scenario. The outcome of this is an average CO_2-emission of 1.30 Gg CO_2/year for the period 2013 to 2020.

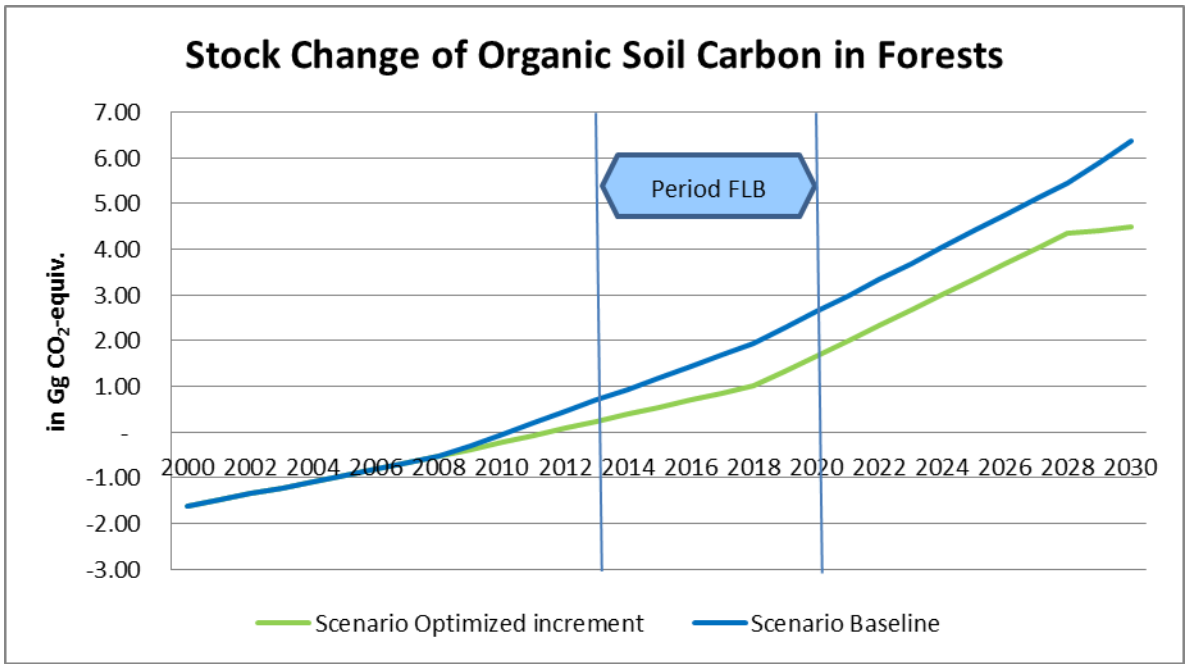

Figure 5: Stock Change of Organic Soil Carbon in Forests;
References: Hofer et al, 2006

The above shown stock change of organic soil carbon is the result of the YASSO-modelling for the publication of 2006, scenarios "Optimized increment" and "Baseline". In this illustration the actual harvests between 1998 and 2009 are not taken into account. The outcome is an average CO_2-emission of 1.2 Gg CO_2/year for 2013 to 2020.

(e) Harvested wood products;

To illustrate the impact of consumption changes a simple model of the timber industry in the civilizational cycle was developed. This is based on the model Xyloikos, which was created in the course of a doctoral thesis at the ETH Zurich and was rebuilt for the asked questions here. The values of today's wood flows and stocks were determined by analogy to Swiss investigations. By simulating the development of consumption from 1900 until 2100, the stocks and stock changes of the different product groups where calculated. The scenarios differ in consumption change between 2000 and 2030. The Baseline-scenario raises consumption by almost 7%, the scenario “Optimized increment” by 26%.

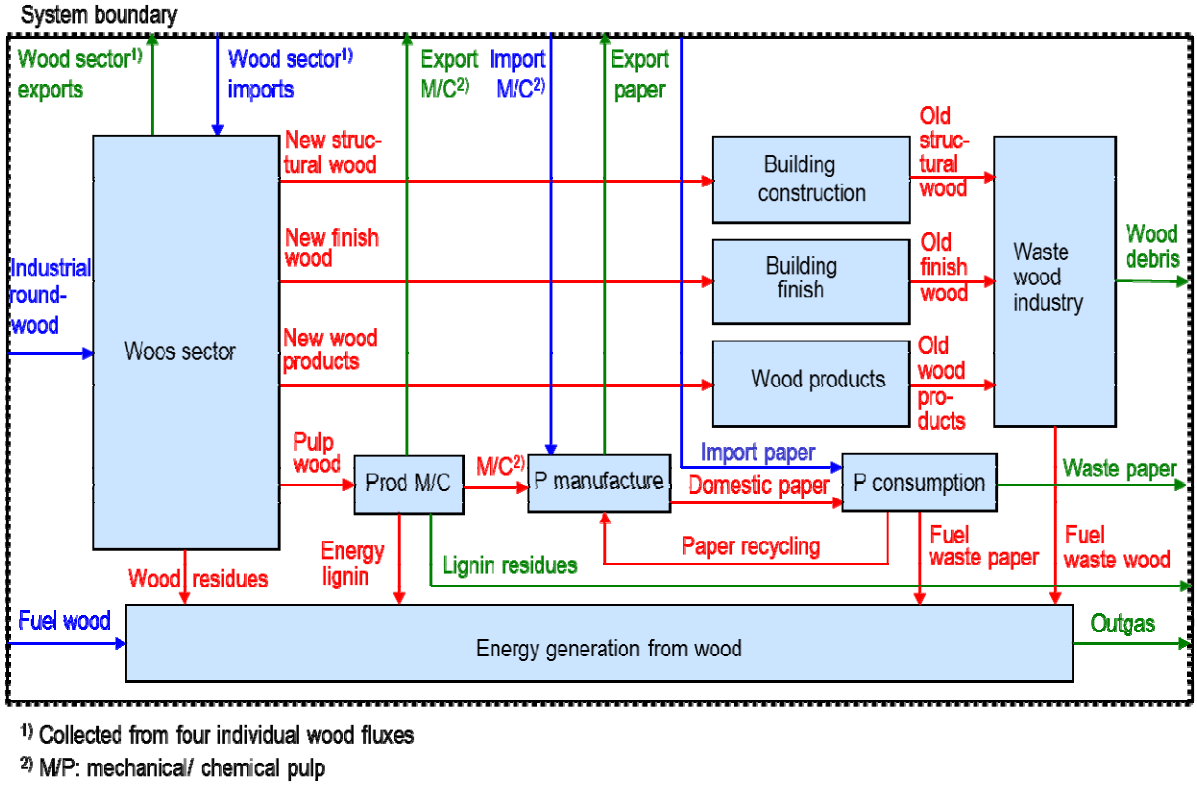

Figure 6: Model Description: The System Timber Industry
References: Taverna et al. 2007

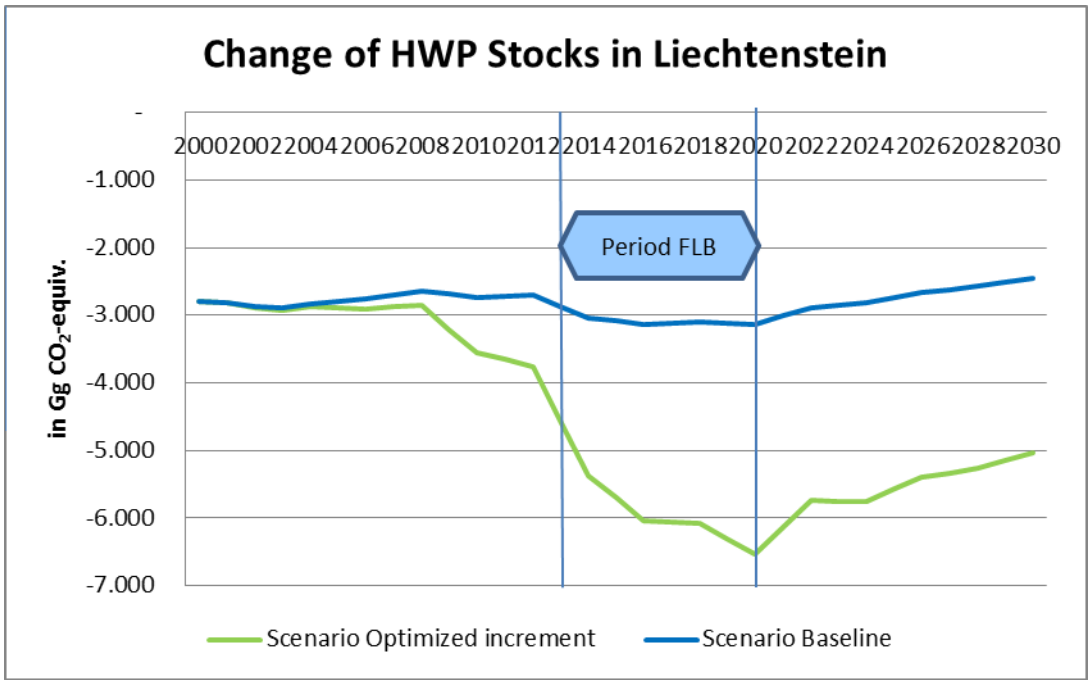

Figure 7: Change of HWP-stocks in Liechtenstein;
References: Hofer et al, 2006

The modelling of wood utilisation covers the time spread from 1900 to 2100. The illustration shows the stock change in a period of consumption change. In both scenarios stocks are raising. This means a sequestration of CO_2 in wooden products. As in the scenario "Optimized increment" HWP from Liechtenstein's forests represent ca. 56% of the wood consumption ("Baseline"-Scenario: 50%), the stock-change has to be reduced to an average value of – 2.40 Gg CO_2/year.

Please see point 8) Calculation of Harvested Wood Products for some basic information.
For more details on the model, please see original document of the references list *(HOFER et. al., 2006; Taverna et al. 2007)*.

(f) Disturbances in the context of force majeure;

Force majeure events were not included in the reference level. The only two force majeure events affecting Liechtenstein in the last 2 decades were the major storms Vivian (1990) and Lothar (1999). The emissions from these events as well as the subsequent secondary damage from insect infestations were not included in the calculation of the reference level (see ANDERSON et. al., 2011).

(g) Factoring out in accordance with paragraph 1(h) (i) and 1(h) (ii) of decision 16/CMP.1.

Factoring out the effect of elevated CO_2 concentrations was not performed for historical nor projected data, because the effects cannot yet be estimated reliably and considerable scientific uncertainties remain. In fact, several Swiss field experiments, have shown, that an increase in CO2- as well as N-concentrations does not necessarily lead to long-term increase sequestered carbon in living biomass:
- KOERNER (2006) did not find a correlation between elevated CO2-concentration and tree growth at the Swiss measurement site Hofstetten.

- Elevated N-deposition can lead to a decrease in gross growth (see BRAUN et.al. 2011)

The mentioned few studies only illustrate how conflicting the scientific evidence still is, calling for another approach to factoring out (see ANDERSON et. al., 2011).

Ad 10) Provide description of any other relevant elements considered or treated in the construction of the forest management reference level, including any additional information related to footnote 1 in paragraph 4 of this decision

Policies included

Ad 11) Provide description of the domestic policies adopted and implemented no later than December 2009 considered in the construction of the forest management reference level and explain how these polices have been considered in the construction of the reference level.

A modern forest law ensures the forest area and distribution in both quantitative and qualitative terms. The current forest legislation, which did not change since 2009, is also a guarantee that the forest is managed sustainably and relates to all forest functions (Liechtensteinisches Landesgesetzblatt, 1991).

This act is intended to:
a) maintain the forest in its area and its spatial distribution and if necessary increase ;
b) protect the forest in its own value and as a biocenosis;
c) ensure that the forest's functions, including the protection, welfare and recreation and the utility function;
d) protect the habitats and living conditions of endangered flora and fauna;
e) support and maintain forestry;
f) contribute to that life of human beings and material assets are protected from natural disasters such as avalanches, landslides, erosion and falling rocks.

In Liechtenstein today overall than 1,280 ha are protected areas and 555 ha of forest area have a status as special protected areas (Sonderwaldflächen). This represents approximately 27% of the total forest area, which in relation to international standards very high.

The wood of Liechtenstein was also certified according the methodology of the Forest Stewardship Council which was founded in 1993 in Toronto. Until now, the FSC certification system recognises worldwide six organizations, including the SGS International Certification Services Ltd, which offered a certification program for the forest in Liechtenstein. Since 2001 all Liechtenstein forests are certified according to the criteria of the FSC (Forest Stewardship Council). This internationally recognized label provides assurance that the forest is managed in an environmentally and socially sustainable manner. Since 2007 all forests of Liechtenstein are also certified according to PEFC.
A National Forest Programme was defined, which integrates the sustainable forest management. Further a regulation on special forest reserves and forest areas (Liechtensteinisches Landesgesetzblatt, 1991) with specific rules was established.

Liechtenstein has integrated its climate policy very strongly into the individual sectoral policies. The focus is on energy policy, environmental policy, transport policy, agricultural and forestry policy. All of these areas encompass measures that contribute to the reduction of climate gases. In order to ensure a coordinated implementation of climate policies within the various areas the government passed a Climate Protection Strategy in 2007. The strategy requires an interdisciplinary coordination in the fields of environment, energy, building, transportation, agriculture and forestry with respect to the development of climate policy measures. Liechtenstein's Ministry of Environment and Land Management, Agruculture and Forestry and the Office of Environmental Protection are the coordinating authorities with respect to the execution of the Climate Protection Strategy.

Because of the small size of the country, however, cross-border cooperation plays an important role. Especially important is the relationship with Switzerland and the cooperation among the countries in the Lake Constance area (Germany, Austria, Switzerland). Thanks to the Customs Union Treaty, cross-border measures and bilateral implementation are simplified in many areas, since various Swiss enactments are directly applicable in Liechtenstein pursuant to the Treaty. In these cases, Liechtenstein executes the provisions similarly to a Swiss canton (e.g. mineral oil tax). Accordingly, most policy areas are closely linked with Swiss policy, in terms of both content and implementation.

Pursuant to the cross-border cooperation with Switzerland, Liechtenstein and Switzerland concluded 'The bilateral Agreement between the Principality of Liechtenstein and the Swiss Confederation on Environmental Levies within the Principality of Liechtenstein' (2009). The agreement enables Liechtenstein to implement several environmental levies of Switzerland into national law while using the existing infrastructure of the Swiss authorities for the execution of the respective national laws. The Ministry of Environment and the Office of Environmental Protection and the Office for Foreign Affairs are the competent authorities with respect to the execution of the bilateral agreement.
Based on the above, a series of legislative and administrative arrangements to reduce emissions of greenhouse gases have been put into force in the past:

-Climate Protection Strategy (2007): basis for a clear strategy to realise a consequent and transparent climate policy and to define the manner in which to fulfil the emission reduction commitment domestically and abroad.

-Emissons Trading Act (2008): sets up the general framework for the fulfilment of Liechtenstein's reduction obligations originating from the respective ratification of the Kyoto Protocol. The EHG states that emission reductions are first and foremost to be reduced by inland measures. If the reduction obligations cannot be fulfilled through national measures, the government may participate in project activities abroad or in international emissions trading. Besides this, the EHG implements Directive 2003/87/EC (Emissions Trading Directive) into national law and obliges two industrial installations (2009) to participate within the European Emissions Trading Scheme.

-Energy Efficiency Act (2007): adopted to push the energy concept 2013 which postulates different energy political goals and contains a bundle of measures for a meaningful use of energy in Liechtenstein.

-CO_2-Law (2009): corresponds with the CO_2 Act of Switzerland (in force since 2008) and introduces a levy on the consumption of fossil fuel (oil and natural gas). The CO2 Act is part

of ’The bilateral agreement between the Principality of Liechtenstein and the Swiss Confederation on Environmental Levies within the Principality of Liechtenstein’.
- The climate cent (2005): levied on engine fuel in Switzerland since October 2005 is also being levied in Liechtenstein. The Government has signed an agreement with the Swiss ‘Climate Cent Foundation’ to this effect, governing the administrative and organisational measures. The revenue will be earmarked for climate protection projects in Liechtenstein and abroad.

-Action Plan Air (2007): measure plan according to air pollution control regulations within the Environmental Protection Act.

Ad 12) Provide confirmation that the construction of the forest management reference level neither includes assumptions about changes to domestic policies adopted and implemented after December 2009, nor includes new domestic policies.

The estimation of future harvesting rates is based on the assumption that the policy described under point 11) is being continued. This policy has been developed since 1865, has been renewed in 1991 by integrating the principles of sustainability aiming of all forest functions and of using near to nature forest management technologies, and was implemented before 2009. Since then, no new wood policies have been developed nor envisaged.

References

HOFER et. al., 2006: Wald, Holz und CO2 im Fürstentum Liechtenstein - Optimierung von Waldwachstum, Holznutzung und Holzverwendung bezüglich CO2-Senken- und CO2-Substitutionswirkung

TAVERNA R., HOFER P., WERNER F., KAUFMANN E., THÜRIG E. 2007: The CO_2 Effects of the Swiss Forestry and Timber Industry. Scenarios of future potential for climate-change mitigation. Environmental studies no 0739. Federal Office for the Environment, Bern. 102 pp.

ANDERSON et. al., 2011: Switzerland`s Submission on Reference Levels as an accountingapproach for Forest Management under the Kyoto Protocol. http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_switzerland_2011.pdf

Office of Environmental Protection (OEP) 2010: Liechtenstein's greenhouse gas inventory 1990-2008. http://www.llv.li/pdf-llv-aus-nir_lie_submission_2010.pdf

Office of Environmental Protection (OEP) 2010: Liechtenstein's Fifth National Communication under the UNFCCC and the Kyoto Protocol. http://www.liechtenstein.li/klimabericht10_fl_eng.pdf

Office of Environmental Protection (OEP) 2007: Liechtenstein's Initial Report under Article 7, paragraph 4 of the Kyoto Protocol. Corrigendum 19. September 2007. http://www.llv.li/pdf-llv-aus-initial-report-lie_corrigendum_200709.pdf

Office of Environmental Protection (OEP) 2010: The European environment – state and outlook 2010. Climate change mitigation. http://www.eea.europa.eu/soer/countries/li/soertopic_view?topic=climate change

Office of Forest, Nature and Land Management 2000: Liechtensteinisches Landeswaldinventar Ergebnisse der zweiten Erhebung 1998. http://www.llv.li/pdf-llv-awnl-landeswaldinvent.pdf

KOERNER, CH. 2006: Plant CO2 responses: an issue of definition, time and resource supply. New Phytologist, 172: 393-411.

BRAUN et.al. 2011: Auswirkung erhöhter Stickstoffbelastung auf die Stabilität des Waldes. Institut für Angewandte Pflanzenbiologie.

Liechtensteinisches Landesgesetzblatt 1991: Waldgesetz. http://www.gesetze.li/DisplayLGBl.jsp?Jahr=1991&Nr=42