

Efficient Management of Forest Infrastructure at Thuringian State Forests

Role of Forest Access and Appropriate
Road Building Solutions for
ThüringenForst

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3. ThüringenForst in Figures : Responsible for

- Annual **turnover** of about **106 mill. Euro**
- About **1,300 employees**
- About **200,000 hectares** ThüringenForst-owned state forest
- Harvesting and marketing of **1.2 mill. cubic meters of timber**
- About **5,000 kilometres** of long-term maintenance, truck-trafficable roads

3. ThüringenForst in Figures : Responsible for

- **Services** for private und municipal forest owners
- Forest **pedagogics** and **recreation**
- **nature conservation** projects and climate-change adapted **forest conversion**
- Initial as well as postgraduate **education** and qualification
- **Sovereign surveillance of 550,000 hectares** of forest

1. Value of Forest Access from a Multifunctional Perspective

Our Service Road- Your Recreation Road Serves as...

- ...Service road for forest management and timber harvest
- ...Rescue route in case of accidents
- ...Means of disaster control (forest fires, bark beetle calamities, etc.)
- ...Access for forestowners as well as for exercising of administrative duties and for hunting...

1. Value of Forest Access from a Multifunctional Perspective

**Our Service Road- Your Recreation Road
Serves as...**

- ...Sports field for hikers, runners and horseback riders
- ...Space of peace and recovery from the everyday stress
- ...Place of work in rural areas
- ...

1. Value of Forest Access from a Multifunctional Perspective

**Our Service Road- Your Recreation Road
Serves as...**

... habitat:

- Embankments as feeding areas for game
- Ditches/settling ponds at road passages as temporary wetlands
- Inner forest's edge as structural element for biotope networking

2. Forest Road Information System (WIS)*

- Means of securing **needs-oriented forest access** (§ 19 para. 2 no. 5 Thuringian Forest Law)
- Instrument of inventory, planning and controlling
- WIS-database: GIS-cartographically representable data of forest roads accross Thuringia
- Data provision for NavLog, a timber transport navigation system (developed by kwf) used accross Germany

*according to service regulation „Principles of Forest Access“

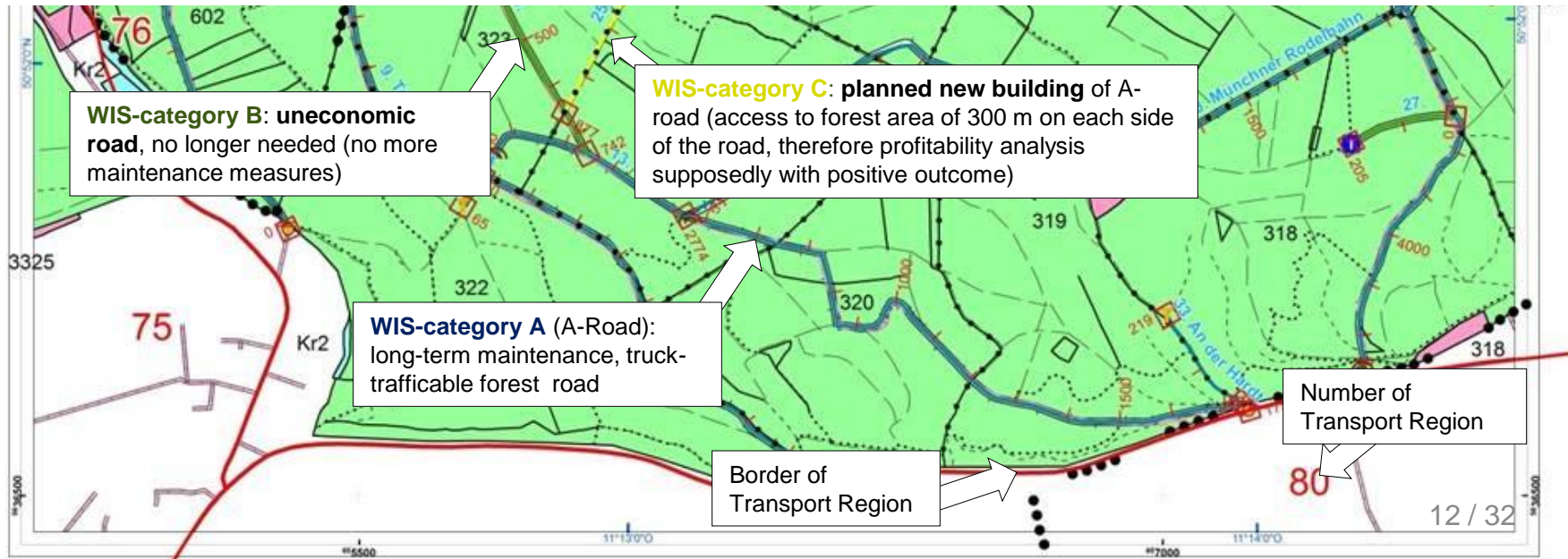
2. Forest Road Information System (WIS)

2.1 WIS-Forest Roads

- Every WIS-forest road is assigned to a **category**, a **function** and a **level of damage**
- Roads in **WIS-category A**, short: **A-Roads**, (long-term maintenance, truck-trafficable) in combination with WIS-function „**main forest road**“ (unsealed gravel construction) play a crucial role for forest access

2. Forest Road Information System (WIS)

2.2 Representation of WIS-Categories/-Data on GIS Map



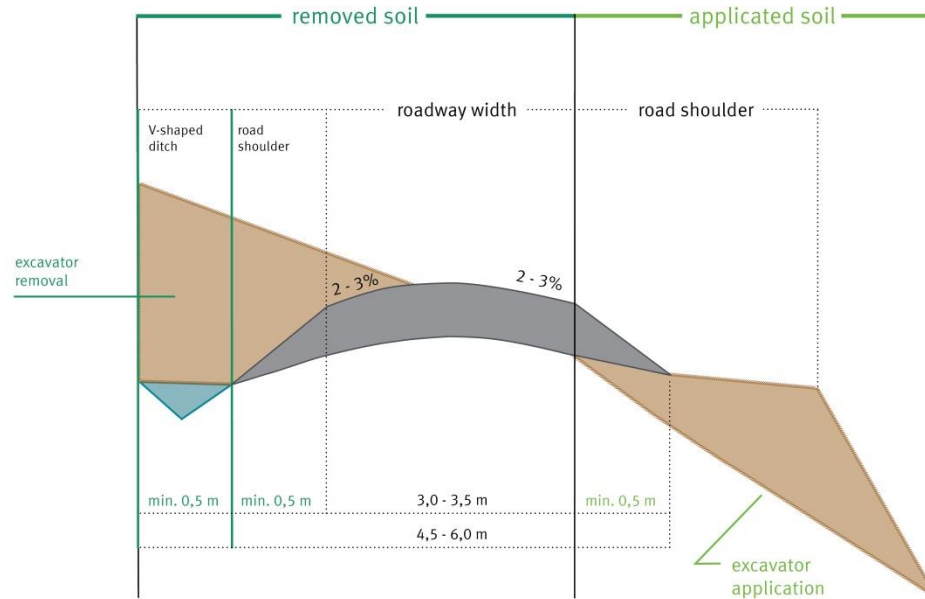
3. Profitability of Forest Roads

- Fundamental Objective: reduction of skidding costs by new building of forest roads (**Target Road Density**: optimum between skidding costs and building costs)
- Obligatory **profitability calculation** before new building of forest roads: saving of costs within 10 years must exceed the effort of new building
- **Uneconomical roads** (planned/existing) are eliminated in the course of periodic WIS-inventories

4. The Main Forest Road

- Important WIS-function, A-road if needed for forest access in the long-term and if trafficable for trucks
- Robustness due to construction with several layers of compacted, intermeshing gravel in different particle sizes (carrying capacity up to **45 tons**).
- Ensured timber transportation, at the same time fulfillment of all remaining requirements to forest roads

4. The Main Forest Road

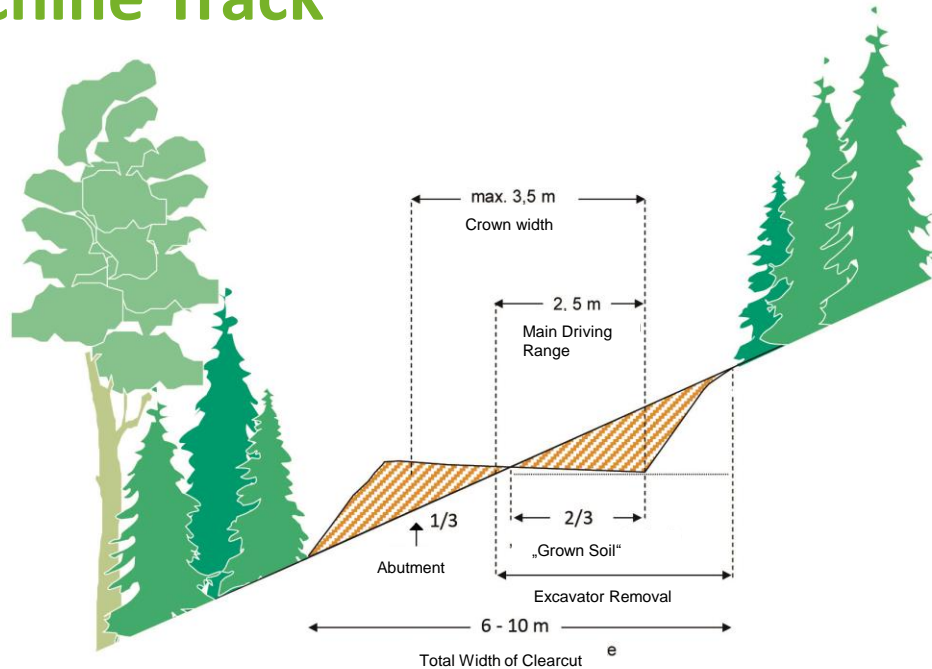


schematic representation
not true to scale

5. The Machine Track

- soil-based, no material installation
- Complement road network, if necessary, and assist forest machinery in their performance
- Parallel fulfillment of further functions

5. The Machine Track



schematic
representation
not true to scale

6. Annual Road Building Planning

6.1 Pre-Planning of Road Building Measures

- Contributory work from forest offices and machine bases to central planning (Headquarters)
- Individual project calculation for new building/basic renewal as well as repair measures of A-roads
- Nomination of necessary repair and new building measures of machine tracks as an added-up sum of running meters

6. Annual Road Building Planning

6.2 Central Planning of Road Building Measures

- **Headquarters:** collection/ verification of pre-planning
 - **Road Maintenance:** central planning according to WIS damage levels, high priority to secure existing network of A-roads (low costs)
 - **Road Repair (A-roads):** generally approved, high priority- similar to road maintenance, also comparatively low costs

6. Annual Road Building Planning

6.2 Central Planning of Road Building Measures

- Central distribution of finances for **new building/basic renewal** of A-roads depending on current road density and allowable cut of each forest office area
- **Embankment Mulcher**: Mulching of A-road ditches/ embankments in 3-year frequency for all forest offices
- **Central digitalisation** of approved road building planning in general business planning software

7. Technical Realisation

- By in-house **machine bases** Gehren and Hohenebra
- Decades of experience with special requirements of forest road building under competitive cost structures
- All road building measures need to be agreed between forest office and regional nature and water conservation authorities

7. Technical Realisation



Wheel Excavator

- Maintenance of A-roads
- Clearing of ditches, installation of road passages

7. Technical Realisation



Chain Excavator

- Building of rough subgrade and excavation of ditches for new building of A-roads
- New building and basic renewal of machine tracks

7. Technical Realisation

Rough
Subgrade
for new building of
A-road



7. Technical Realisation



Grader

- Material installation (new building/basic renewal of A-roads)
- Maintenance (A-roads)

7. Technical Realisation



Trailer-Type Roller

- Compaction (rough subgrade of A-roads and machine tracks, material layers of A-roads)

8. Cost Rates for Road Building Measures

Type of Measure	Ø Cost Rate [€/rm] In-House MSP	Ø Cost Rate [€/rm] External Services*
New Building/ Basic Renewal of A-Roads	25-40	40-45
Repair of A-Roads	10-15	15-20
Maintenance of A-Roads	1-2	n/s
New Building of Machine Tracks	3-5	4-5
Repair of Machine Tracks	1-2	1-2
Embankment Mulching	0,5-1	n/s

*Statistical population too small for statistically significant results

9. Time Series of Financial Effort for Road Building


Financial Effort for Road Building Measures 2007-2017	
Business Year	Total Effort [approx. in mill. €]
2007	6,1
2008	14,5 ¹
2009	7,5
2010	8,5
2011	9,1
2012	9,1
2013	13,2 ²
2014	9,4
2015	9,2
2016	7,8 ^{3,4}
2017	7,1 ^{3,4}

¹ incl. about 7 Mill. € grant funds (Kyrill damage repair); ² incl. flood damage repair; ³ preliminary/ planned; ⁴ plus ca. 1-1,5 Mill. € forest office staff costs and measures

10. Mid-Term Objectives/ Prognosis

- Until **2024** approx. achievement of target road density (completion of new building and basic renewal)
- After **2024** 89 % total effort is used for road maintenance and repair (now: ca. 60 %)
- Until **2028** maximum reduction of repair backlog
- After **2028** reduction of total effort by around 30 %

11. Recent/Aspired Forest Access Values

Forest Office	Forest Access Value 2014	Forest Access Value 2015	Forest Access Value 2016		Target Forest Access Value
Saalfeld-R.	54,9	58,2	78,1		≥ 85,0
Sonneb.	52,8	57,4	58,8		≥ 85,0
Neuhaus	68,6	82,0	80,8		≥ 85,0
Schleiz	77,4	71,9	73,4		≥ 85,0
Frauenw.	80,5	88,4	89,7		89,7
Neustadt	79,4	76,9	81,9		≥ 85,0
Weida	84,8	84,6	84,9		≥ 85,0
Jena-H.	85,1	82,8	79,5		≥ 85,0
Gehren	91,5	86,4	86,2		86,2
Schönbr.	93,2	90,6	92,1		92,1
Heldburg	94,5	97,7	97,1		97,1
Schmalk.	61,6	66,2	81,7		≥ 85,0
Finsterb.	65,9	70,9	68,7		≥ 85,0
Bad Salz.	74,4	77,7	83,2		≥ 85,0
Hainich-W.	75,1	75,3	76,8		≥ 85,0
Sondersh.	77,5	87,8	91,0		91,0
Oberhof	78,2	83,1	83,6		≥ 85,0
Heiligenst.	84,1	84,1	94,6		94,6
Leinefelde	85,3	88,8	91,3		91,3
Kaltenn.	86,6	90,3	86,7		86,7
Marksuhl	84,0	84,2	81,3		≥ 85,0
Bad Berka	88,0	91,2	90,8		90,8
Erfurt-W.	94,0	92,3	90,7		90,7
Bleich.-S.	93,7	93,6	93,6		93,6
Total	73,9	76,5	82,9		≥ 85,0

12. ThüringenForst Forest Road Densities

- **28 lfm/ha** as a target road density for ThüringenForst appears consistent compared to other German SFOs with similar geographical conditions
- Difference between target and current road density compared to other SFOs can be rated comparatively large for ThüringenForst (**3 rm/ha sf**)
 - Costly new building and basic renewal still keeps up the annual total effort

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