

A landscape of fluvial transport routes

The Eastern Alpine section of the Danube river and its tributaries in pre-modern times

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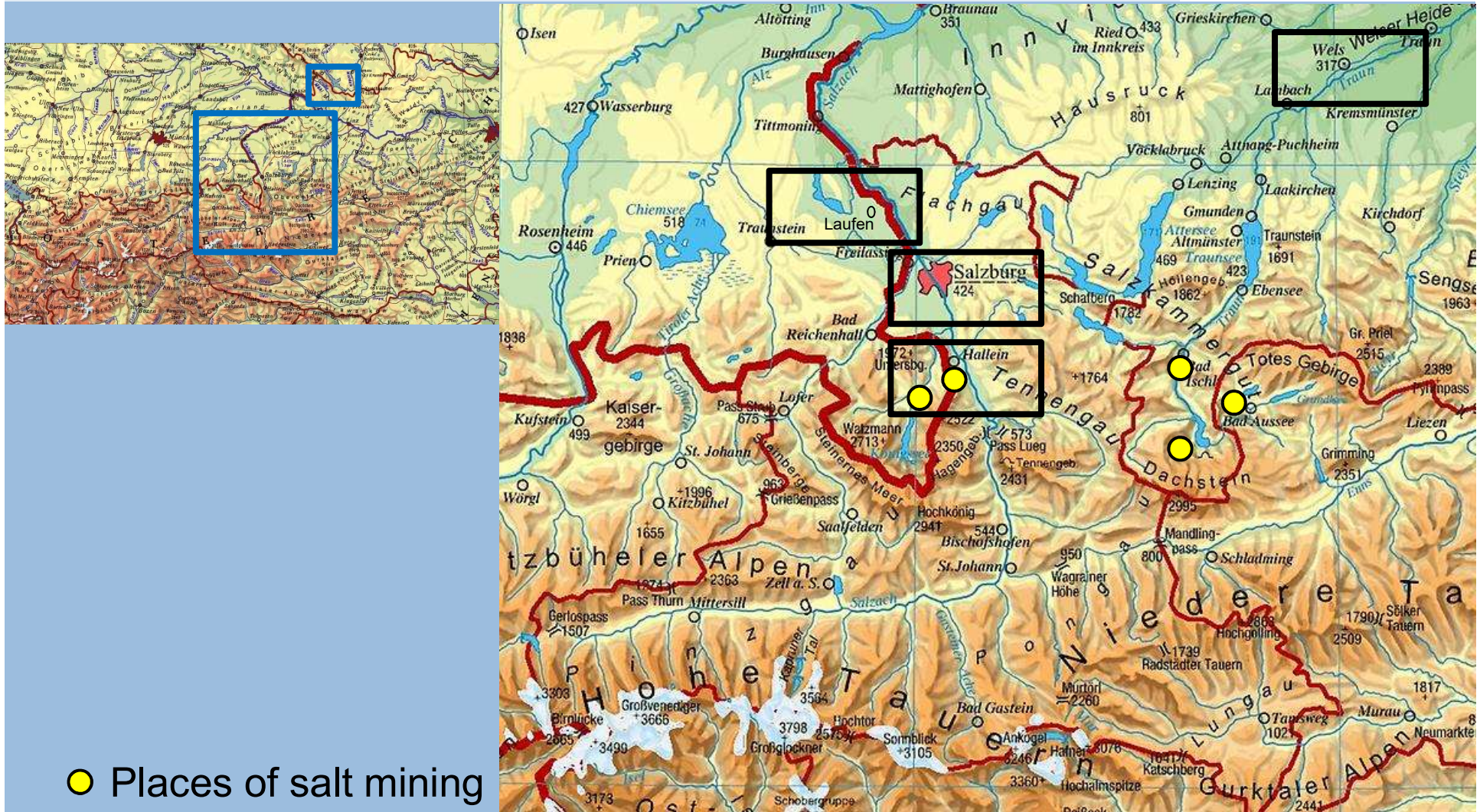


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The area under research

The catchment area of the Danube river in the Eastern Alps (Salzach, Inn, Traun) and the Bohemian Forest



● Places of salt mining

Sources

- Written sources
 - Toll registers
 - Books of expenditures for salt, wood, iron ore
 - Chronicles
- Pictorial sources
 - Historical maps
 - Paintings, e.g. the *Fürstenzimmer* series of Hallein (Salzburg)
 - Graphics with technical illustrations (riverbed protection, bridges, ships)
- Built environment
 - Drift wood channels
 - Rakes, barriers
 - Riverbed protection

Sources

The Fürstenzimmer series of Hallein (Salzburg)

- *Fürstenzimmer*
 - 3 large rooms in the palace of the salt master in Hallein
 - Canvas tapestry in different colours
 - “Spurious” picture frames
- Series of 73 paintings by Benedict Werkstötter (1757/1758)
 - Salt mine
 - Saltern
 - Wood supply
 - Transport



Navigation on rivers

- Transport of persons and goods carried out on inland waterways since prehistoric times, if possible
 - Roman road system declines in the Middle Ages
 - Impassability of paths after heavy rain
 - No gradients and impassable bottlenecks
 - Higher transport capacities on ships and rafts
- Problems of river navigation
 - Too dangerous at high water level (especially in spring and summer)
 - Difficulties with shoals at low water level (especially in autumn and winter) – scratching of the riverbed necessary (ploughing)
 - Rapids, rocks
- Towing the ships upstream (“Treideln”, “Recken”)
 - Ships are pulled upriver by humans or horses
 - Workers towing the ships fight against the use of horses (15th c.)
 - Towpaths along the riverbank have to be maintained regularly

Navigation on rivers

Towing ships for salt trade on the Salzach und Inn rivers



Depiction of upstream towing (“Treibfahrt”) and downstream navigation (“Naufahrt”) with a large salt trading ship at the Salzach and Inn rivers.

Passauer Schifflutezchbuch, 1422, Passau, Stadtarchiv

Navigation on rivers

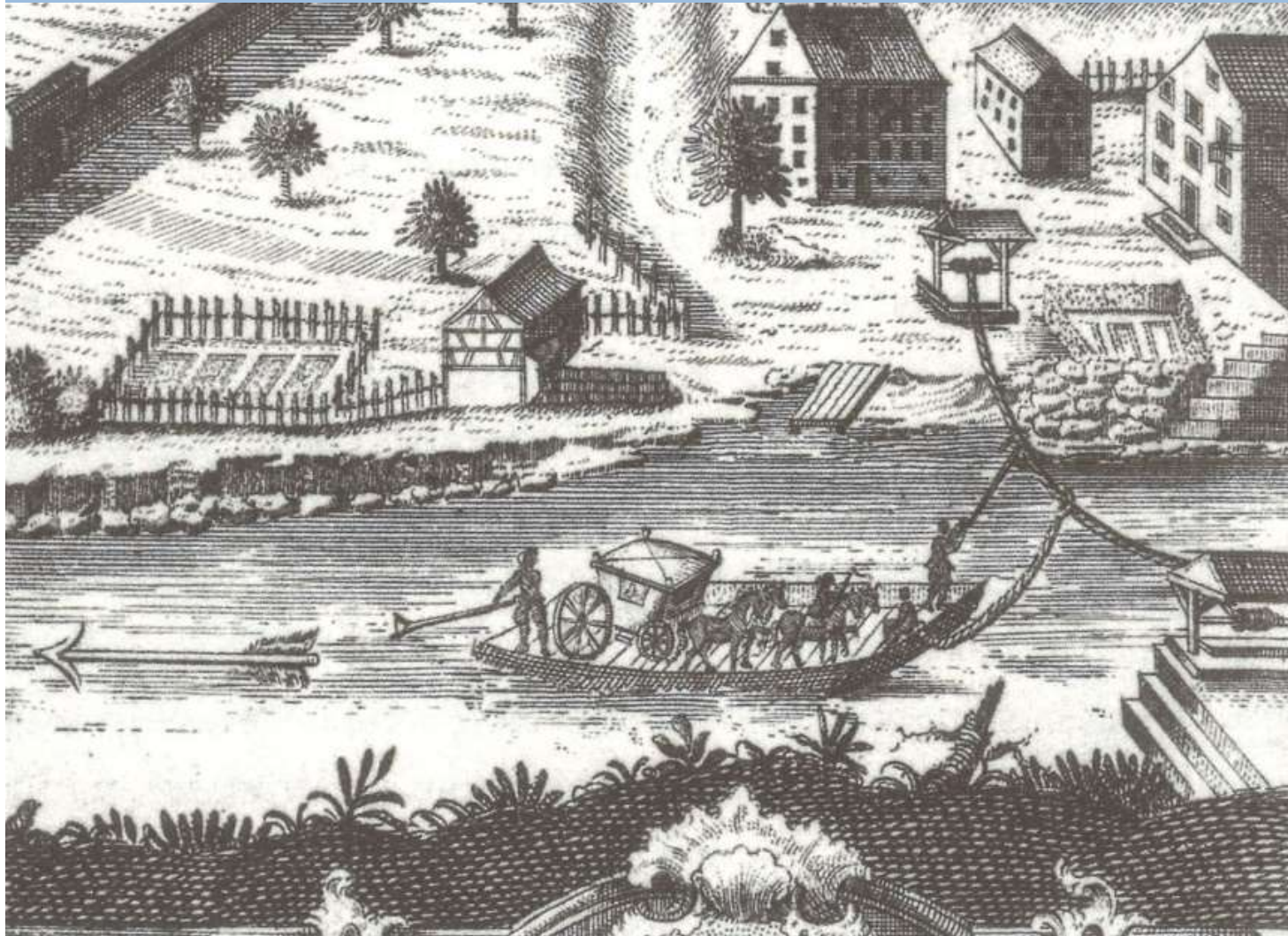
Towing ships for salt trade on the Danube river

Prospect of a complete
Electorate-Bavarian
salt ship convoy, water
colour, early 19th c.,
Regensburg, Historical
Museum, GN 1994/2



Navigation on rivers

Ferry services

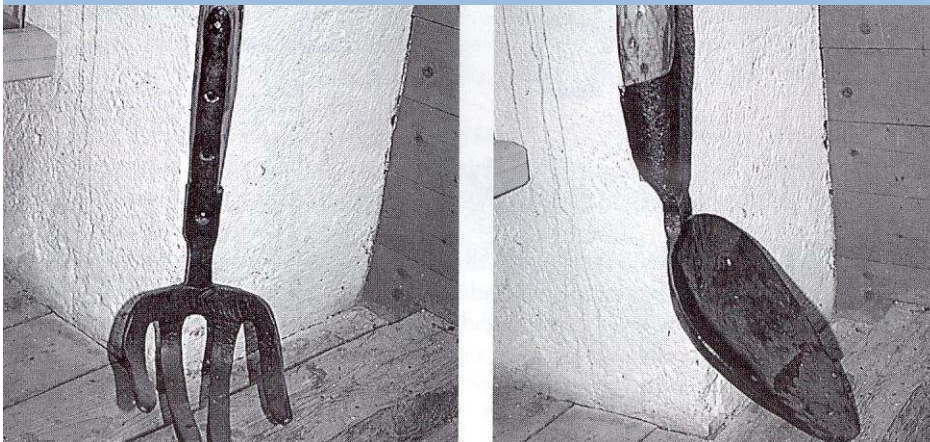
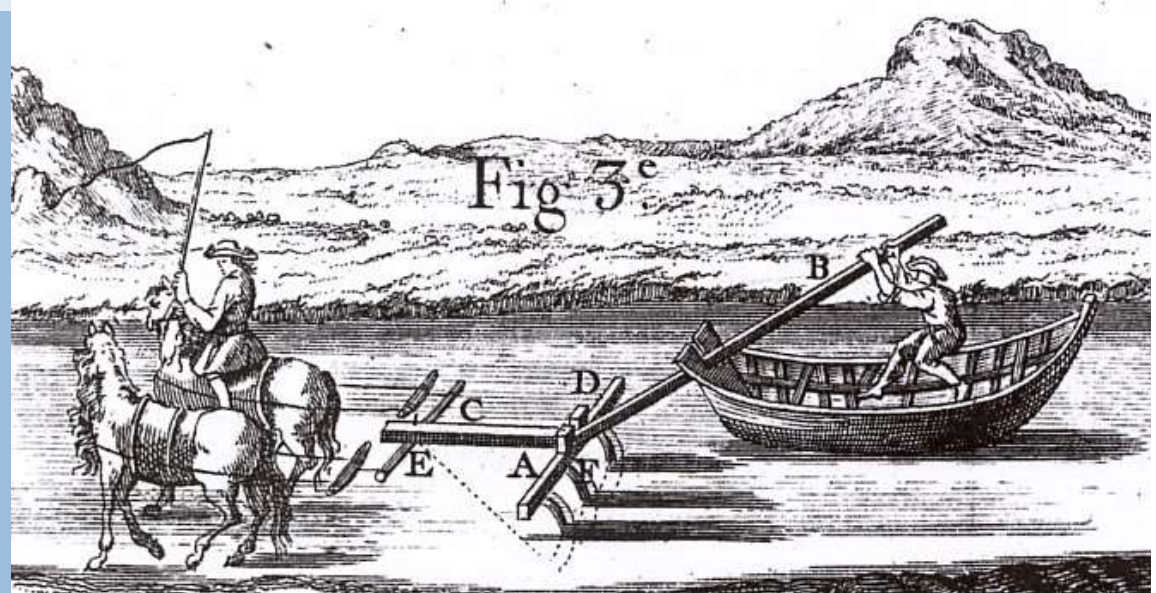


Rope ferry at the Limmat river in Wettingen (Aargau, Switzerland), etching by Franz Xaver Schönbächler, 1754

The problem of low water for navigation

Deepening and clearing the riverbed

Scratching of the riverbed.
Source: Belidor 1753



“Kreil” und “Gatz” to clean the riverbed from gravel stones. Heimatmuseum Bramberg am Wildkogel (Salzburg)

Transport of wood on Alpine rivers

Deepening and clearing the riverbed

- Wood/timber as the most important material and fuel until the early 19th century
 - “Era of timber” (“Hölzernes Zeitalter”, Joachim Radkau)
 - Construction material (houses, bridges, technical structures, protective structures)
 - Fuel in the smelting process (metals) and in salt extraction
- Transport of tree trunks as a logistical challenge
 - Wood drift on the rivers from the mountains to the pre-Alpine areas
 - Single trunks or flosses
 - Risk of damage to shore fortifications and bridges
- Large rakes (loggers) for the recovery of tree trunks near smelting works and salterns
- Main cause of flood damage (“torpedoes”)
 - Destruction of bridges, houses and barns

Transport of wood on Alpine rivers

Driftwood

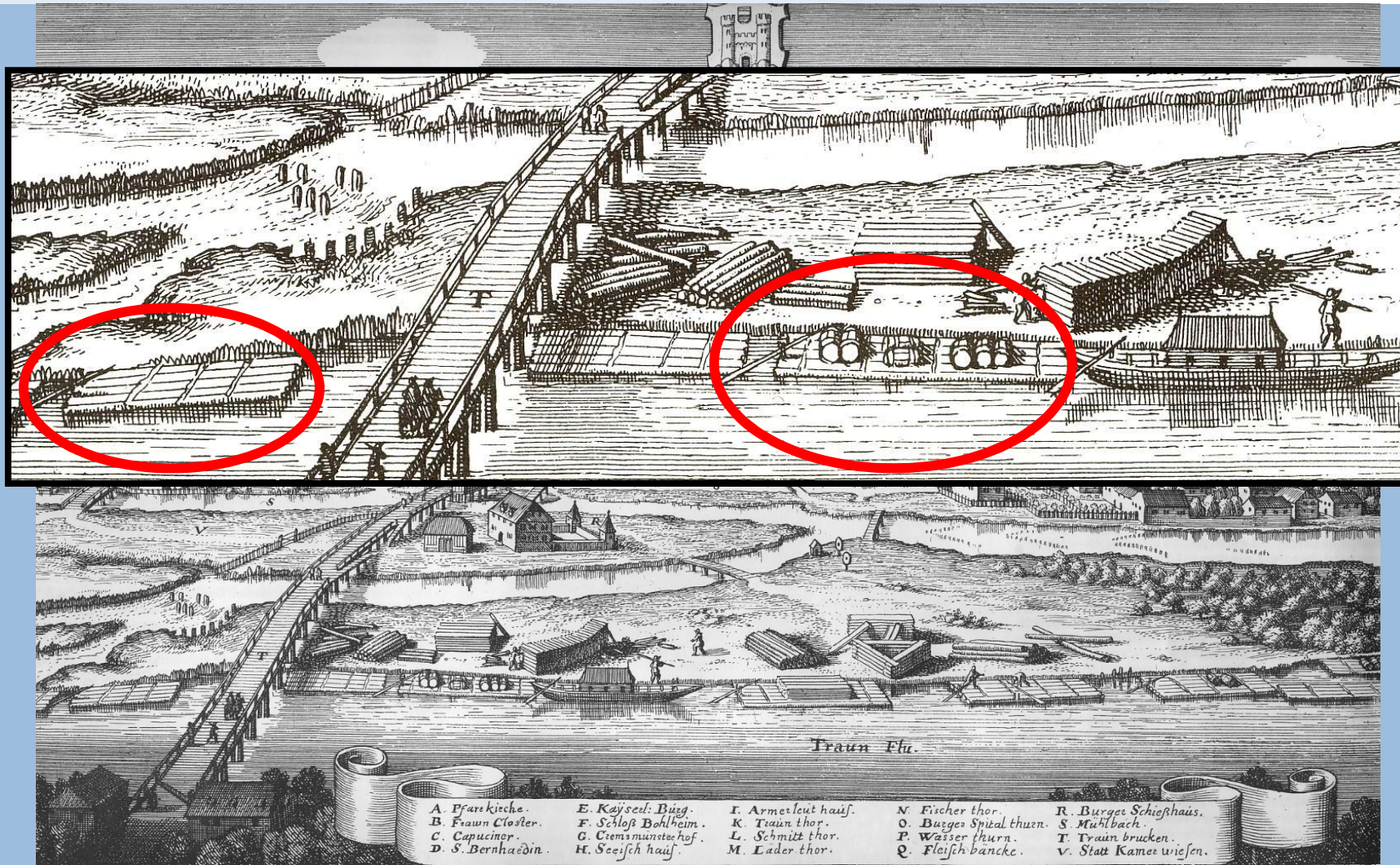


Driftwood on the Salzach river at the rake near Hallein (Salzburg). Oil painting on canvas by Benedict Werkstötter, 1757/1758, Hallein, Keltenmuseum

Transport of wood on Alpine rivers

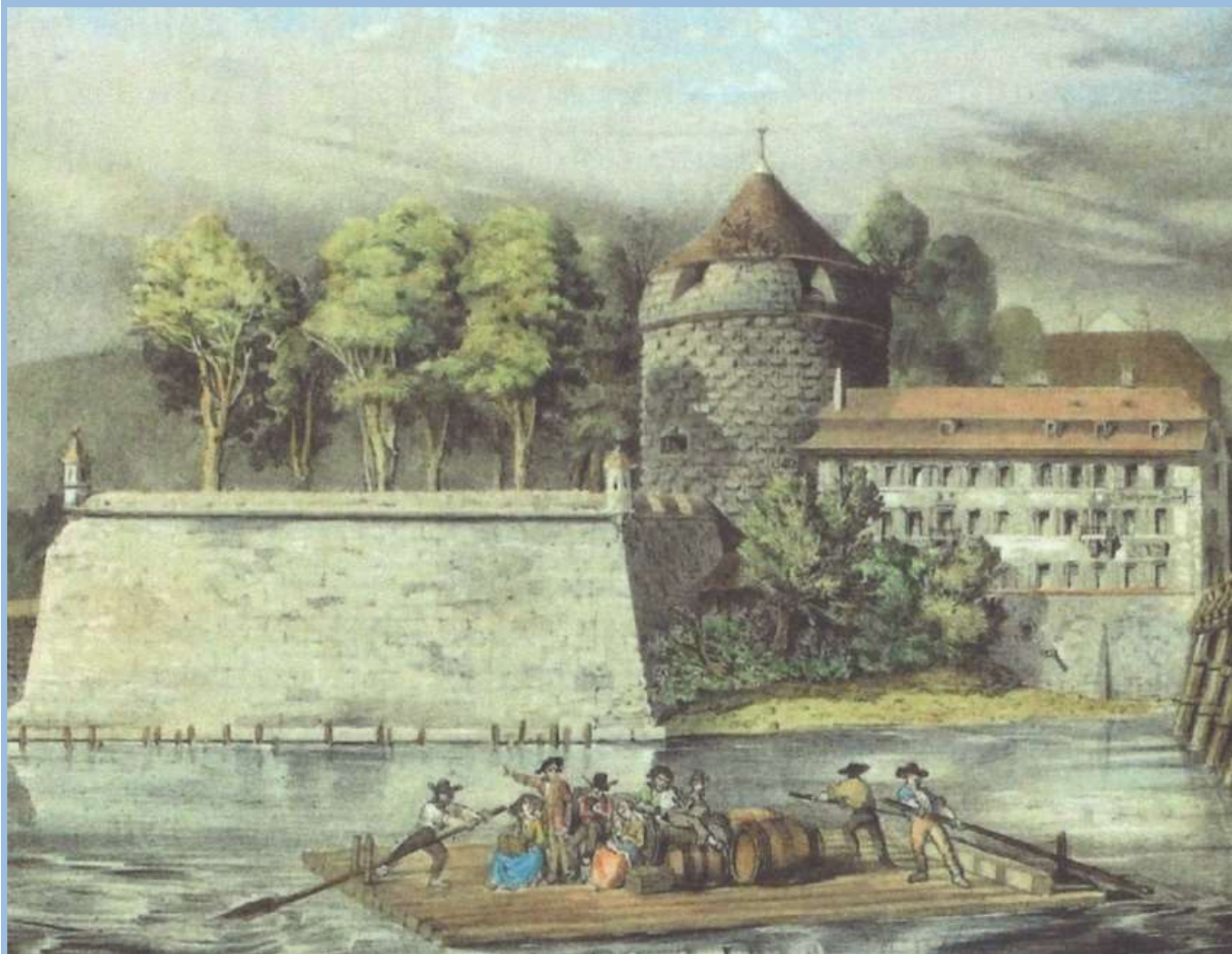
Wels (Upper Austria)

Engraving by Matthäus Merian, 1649



Transport of wood on Alpine rivers

Timber rafting including transport of people and goods



Floss with passengers and payload on the Aare river near Solothurn (Switzerland). Lithograph by Heinrich Jenny (1824-1892)

Transport of wood on Alpine rivers



Work at the rake near Hallein (Salzburg) to provide the saltern with firewood. Oil painting on canvas by Benedict Werkstötter, 1757/1758, Hallein, Keltensmuseum

Transport of wood on artificial channels

The example of the Schwarzenberg driftwood channel

- Schwarzenberg driftwood channel (“Schwemmkanal”)
 - Example from the Bohemian Forest in the border region between Upper Austria and today’s Czech Republic
 - Watershed between the Danube region and the Vltava-Elbe region
 - Constructed for the running of the extensive forest estates of the Princes of Schwarzenberg since 1789 (plans by Joseph Rosenauer, 1775-1778)
- Technical data
 - Total length of almost 50 km including natural river courses
 - Artificial channels (at least 40 cm deep), tunnels
 - Essential for meeting the demand for timber from Upper and Lower Austria to Vienna
- Loss of importance from the mid-19th century onwards
 - Silesian coal transported by rail to supply the metropolises of the Habsburg Monarchy

Transport of wood on artificial channels

The example of the Schwarzenberg driftwood channel



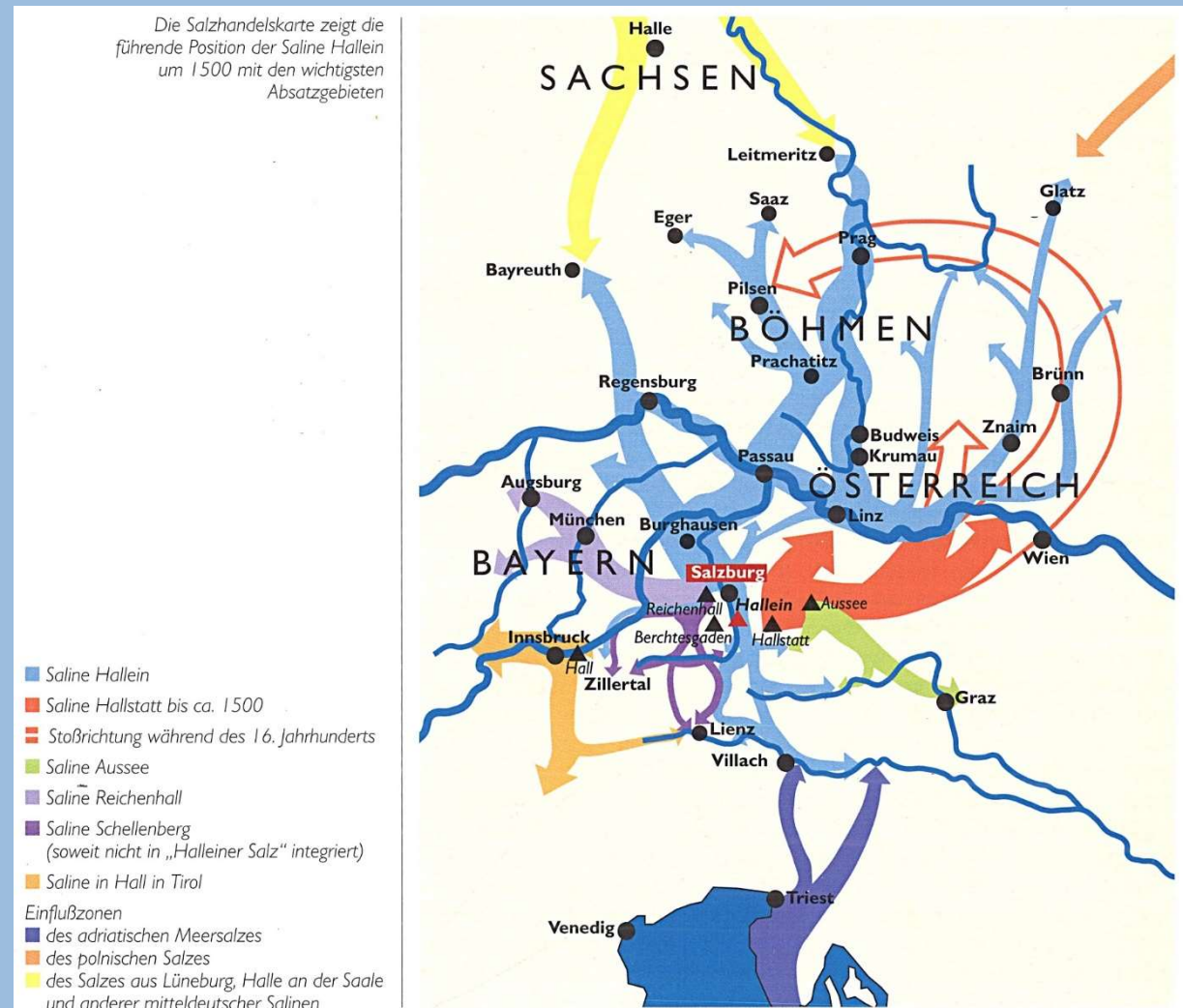
Photos: Siegfried H. (left), Guenther Z. (right),
Wikimedia Commons, public domain CC BY-SA
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Salt trade on the Salzach and Inn rivers

- Salt production along the central Salzach river
 - Salt mining in Hallein near Salzburg since the Celtic era
 - Flourishing of salt mining in Hallein from the 12th century onwards
- Production quantities (according to Fritz Koller)
 - Hallein (1530): 24'700 tons per year
 - Berchtesgaden/Schellenberg: 4'600 tons
 - Bad Reichenhall: 12'500 tons
- Salt transport on the lower Salzach and lower Inn rivers
 - Salt transported in truncated cones (so-called *Fuder*, about 62 kg) on the rivers to Bavaria, Austria, Bohemia and Hungary
 - Depending on the water level, between 2200 and 3300 ships per year in the 16th century (with up to 15 tons of cargo)
 - Transport possible probably around 180 days of the year

Salt trade in the Eastern Alps

Main trading routes in the Danube catchment area



Source: Salt 1994: 144
(catalogue of an
exhibition in Hallein)

Salt trade on the Salzach and Inn rivers

“Bottling” salt into *Fuder* in the saltern of Hallein (Salzburg)



Salt production in the saltern of Hallein (Salzburg). Oil painting on canvas by Benedict Werkstötter, 1757/1758, Hallein, Keltenmuseum

Salt trade on the Salzach and Inn rivers

Preparing the *Fuder* of salt for transportation from the saltern of Hallein (Salzburg)



Salt production in the saltern of Hallein (Salzburg). Oil painting on canvas by Benedict Werkstötter, 1757/1758, Hallein, Keltenmuseum

Salt trade on the Salzach and Inn rivers

Departure of a salt trade ship in Hallein (Salzburg)



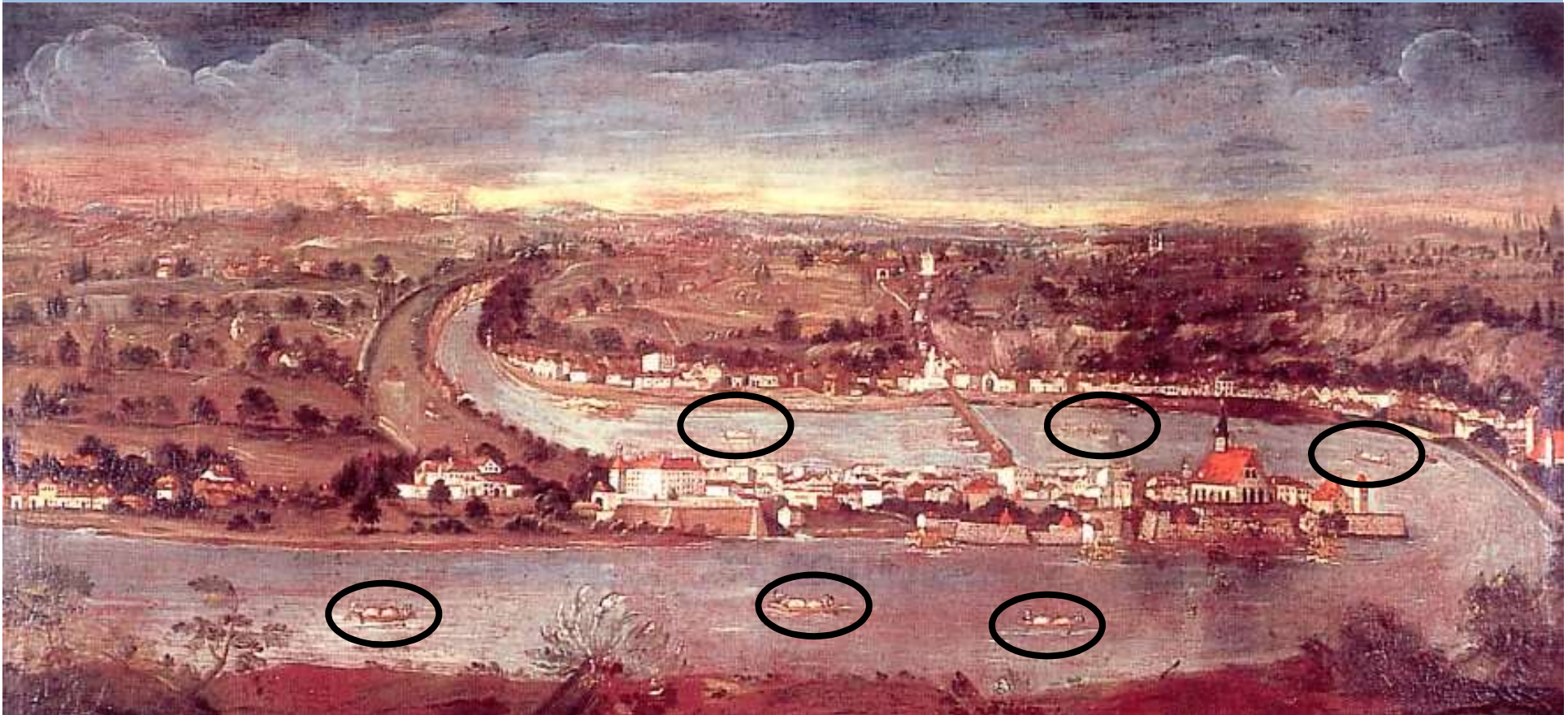
Salt shippers departing from Hallein on the Salzach River. Oil painting on canvas by Benedict Werkstötter, 1757/1758, Hallein, Keltenmuseum

Salt trade on the Salzach and Inn rivers

- Salt shipper guild from Laufen an der Salzach (today Upper Bavaria, formerly Salzburg) with a leading role
 - Know-how in overcoming a difficult double loop with rocks in the river leads at times to monopoly position
 - 1278 Privilege for the so-called *Ausfergen* of Laufen (state officers as guides) by Archbishop Frederic II of Salzburg
 - Small town comes to relatively large wealth
 - In addition, boat guilds in other cities along the transport route (e.g. Schärding, Upper Austria)
- Other production sites and transport routes
 - Hall in Tirol (east of Innsbruck) – shipping over the Inn river
 - Salzkammergut (Altaussee, Hallstatt, Bad Ischl) – shipping via the Traun river

Salt trade on the Salzach and Inn rivers

Ships for salt trade passing the loop of the Salzach river near Laufen



Laufen an der Salzach, oil painting on wood, around 1750

Salt trade on the Salzach and Inn rivers

Laufen an der Salzach (map, around 1790/1795)



Houses and landing quays of the salt shippers at the water-rich outer riverbank of the Laufen loop

The flood of 1572 at the Salzach river

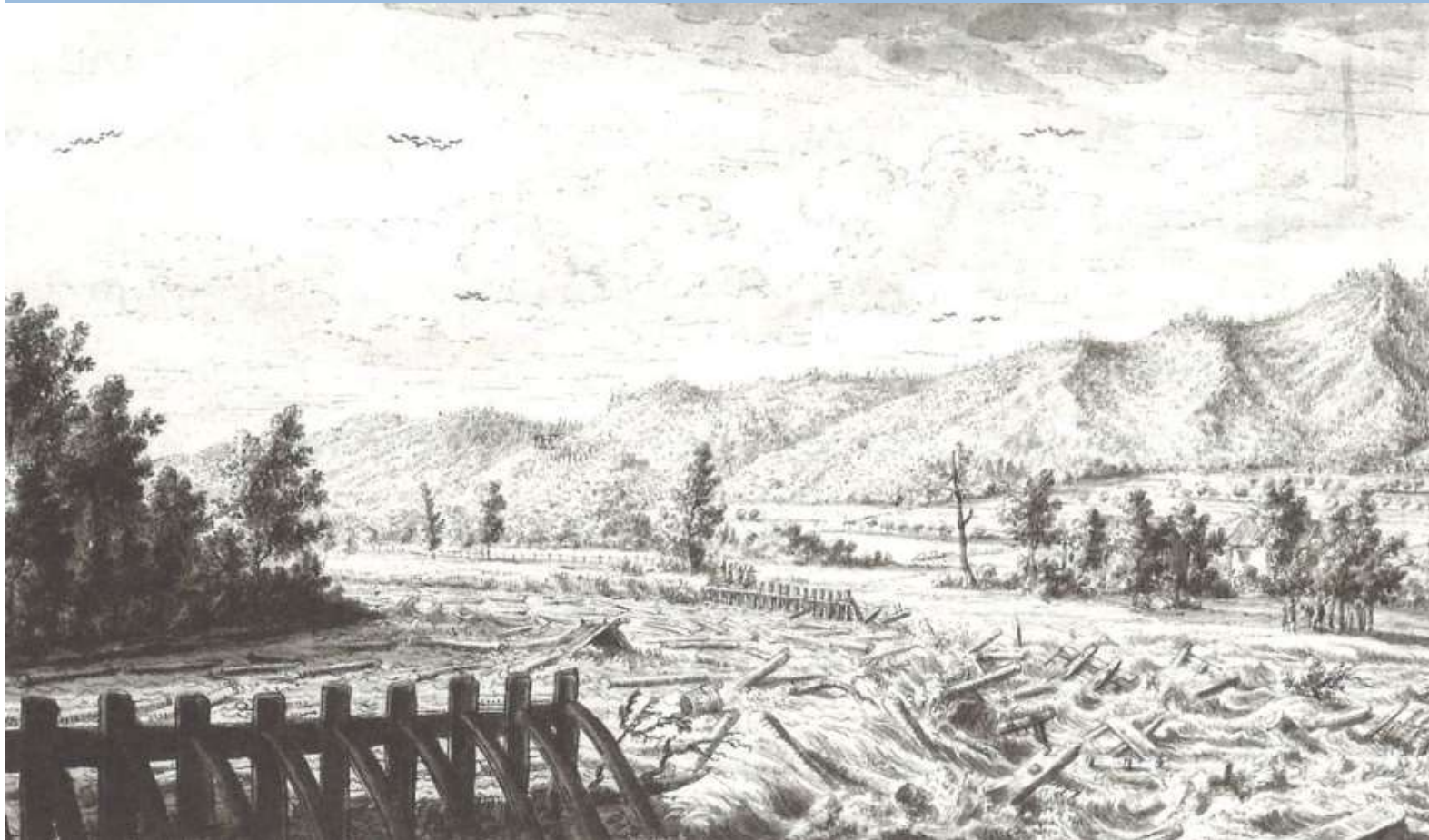
- Flood can be reconstructed well, especially for Laufen
- Severe damage, general shortage of timber for reconstruction
 - Farmers forced to bring back drifted remains of the bridge to Laufen
 - Damage in Laufen amounts to 4000 guilders, including a loan from the archbishop of 2500 guilders
 - Significantly less shipping traffic (affecting mainly the city's salt shippers)
 - In 1572 only 1553 ships, otherwise 2200 to 3300
 - 28 ships sink at the Altach landing quay (otherwise one to two per year)
- Supply with drinking water interruptedn
 - Well pipes lead across the bridge
 - Destroyed as early as 1567 (slow repair)
 - Wooden well pipes become scarce in 1572
 - Deposit in a pond on the Oberndorf side washed away

The flood of 1598 in Salzburg

Anonymous contemporary chronicle from Salzburg:

“Eben in diesem 98 Jar am Tag Maria Himmelvardt [15. August] hueb es an so starckh zu regen [!] und weret zwee tag aneinander, darauss ein überauss grosse Wassergiss angeloffen, das yberall in ganzen Landt grossen Schaden gethann und über die Bruckhn weit gieng. Namb auch alle Brueckhen am ganzen Stramb [Strom] hinwekh und zu Lauffen den hilzen Ganng wo man zu der Pfarkyrchen hinauf gieng, auch unnder Bruckhen vast alle Heisser und Stätl, dessgleichen auch zu Burckhausen. Es runen an der Salzach vill Heisser und Stadl herab unnd soviel Holz von Hällä [Hallein] und Schelnperg ein ganzen Tag, das ein Stockh an dem andern floss ohne das schär Holz, das unndern Wasser gieng, das ein Hundt darüber lauffen het können. Es war erbärmlich zu sehen, dass es vill schenner Gärten umb die Stat zerriss, dass einem niemernd solt gelusten an das Wasser zu pauen.”

Destructive driftwood during severe floods



Collapse of the rake at the Sihl river near Zurich during the flood of 1732.
Drawing by Melchior Füssli

Conclusions

- Danube river and its tributaries in the Eastern Alps frequently used for transport of goods since the High Middle Ages
 - Salt
 - Timber
 - Iron ore, iron products, various other goods (e.g. vegetables, fruits)
- Territories such as the Archbishopric of Salzburg owe a substantial part of their economic wealth to those routes
- Single towns and shippers' guilds profit most
 - *Ausfergen* of Laufen
 - Crossroads of liquid and terrestrial roads (e.g. Wels)
- Environmental factors
 - Extraordinary high and low waters
 - Rapids, rocks, boulder bedload
 - Driftwood out of control

Thank you for your attention!

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