Tyrol-Adriatic Project
C
"River Basin Management" – "River Room Recreation"
Renewable Energy Sources
Electric Mobility

0 GENERAL

The expected consequences of climatic change, the economic and financial crisis and the employment market situation demand extending the Tyrol-Adriatic Project to the sectors of flood prevention, renewable energies, environment, traffic and others.

RIVERS IN NORTH-EASTERN ITALY

The shallow sections of River Adige – North-East Italy's longest stream – come very close to the main ridge of the Alps. The river thus makes a possible waterway between the Adriatic region and Danube. Project B presents the connections between European inland waterways and the Adriatic Sea. In order to make rivers navigable, it is crucial to regulate their high and low tides.

During the snow melt and autumn rain periods, the rivers Isonzo, Torre, Natisone, Tagliamento, Degano, But, Fella, Meduna, Cellina, Livenza, Piave, and Brenta are usually in flood and thus feature very broad riverbeds (partly of several kilometers width). However, in dry periods the respective rivers carry only little water (also as a result of draining for power stations and irrigation purposes) and are in parts even dry due to water loss caused by leaching. Riverside communities as well as the partly densely populated regions in the lowlands suffer from being permanently exposed to this flood hazard. Therefore, projects that aim at banning the respective risk are given priority.

The extraordinarily wide river areas require comprehensive river basin management. In this course, areas becoming available may be deployed for new utilization purposes. The use of hydro power and solar energy for power generation is potential to be exploited within the course of the river basin area's restructuring.

1 RIVER BASIN MANAGEMENT CONCEPT – "RIVER-ROOM-RECREATION"

1.1 Flood Control

1.1.1 Quick water evacuation in the event of flood threatens communities located at the lower reaches and additionally impedes shipping. On some upper reaches (e.g. on River Cellina) storage reservoirs that have the potential to retain water were built. Within the river courses, up to 6 meter high inflatable weirs serve to dam the water to a number of impounding reservoirs, edged by embankments. The width of new river beds depends on the respective river's profile at the lower reaches.

1.1.2 The respective top impoundment is to be designed as retention and collecting basin that serves to retain larger water volumes as well as sand, gravel and flotsam and thus reduce the water's destructive powers. In order to realize this, a deep ditch running transversally through the impoundment ids continuously cleared by a wire rope conveyor mechanism. Additionally, the bottom basin is also designed for larger water quantities in order to be able to stop the turbine/generator units installed at the respective weirs or to allow their function as reversely running pumps that transport the water back to next top basin in the event of excess power supply.

1.1.3 At suitable places, areas for flood control will be used as so-called polders. In order to facilitate this flood control system, the respective areas will be structured as terraces. In the event of flood hazards, a controlled amount of water can be directed to respectively designated spots and – by partially elevating the water level – flow into the polders.

1.2 Expanding River Sections to Waterways

1.2.1 By equipping weirs with ship locks, electrically operated ships can also navigate rivers used as waterways all the way to important business locations in the valley. This applies e.g. to Merano at the River Adige, Goerz at Isonzo River, Ponte al Tagliamento, Nervese della Battaglia at Piave River or Bassano del Grappa at Brenta River.

1.2.2 Ship locks: the ship lock of 112 m or 224 m length and 12 m width will be erected right in the river's bed with as sealed sheet pile walls, which are horizontally supported in direction of the respective river bank's crest. The support structure's watertight sheathing creates an air cushion, which – being covered by floor slabs – turns into a walkable and trafficable surface floating on the headwater. Each ship lock provides the option for a bridge to the other side that allows for crossing the river. The ship lock's locking components will be opened in the event of flood in order to allow the water's unimpeded drain via the lock, which does thus not constitute any obstacle or constriction to the river's profile.

1.2.3 Inside the lock, the water level is lifted or lowerred by means of pump turbines that pump retained headwater in or out through the channels flowing in at the sides.

1.2.4 Padova-Mare Waterway: in this context, it is intended to intergrate currently incomplete Padova-Mare Waterway with the inland waterway of Brenta River, equip it with a PV cover for power generation and open it for ship traffic.

1.3 Aquacultures

1.3.1 Within the respective impoundments, the volume of water will be – compared to the current level – increased many times over especially with respect to residual water ways. Given the present water quality, this will create good conditions for aquacultures, in particular for pisciculture. Since different species and sizes of fish will be kept in separate impoundments, fish migration is undesirable; a fish pass is thus not required. If necessary, the system facilitates a practicable crossing.

1.3.2 In a time of the seas suffering from overfishing, this new industrial sector (pisciculture in ecological river systems) globally faces a promising future. It is thus promoted by both, the Italian Republic as well as the EU. The Act No. 57 as from 03/05/2001 aims at supporting rural development and employment in the sectors of farming and pisciculture (aquaculture) and enhancing environmental protection and landscape conservation.

1.4 Development of Living, Recreational and Leisure Space at the Waterside

1.4.1 In the river basin, larger areas of water will be created to improve the scenery and – due to the increased evaporation rate – additionally ensure more pleasant climatic conditions. In the cities and other communities located at the waterside, the river will be given a new appearance: while the river bed was previously nearly empty due to draining or – depending on peak power generation - at times and certain sections nearly empty or filled with roaring masses of water, the river will now spread a peaceful atmosphere.

1.4.2 This newly found situation as waterside city or community will ensure the emergence of aquatic facilities for water sports, fishing spots at the riverside and recreational areas at suitable places. At the inflatable weirs, passages (slides) for boats might be set up.

1.4.3 Both, the aquacultures as well as the river basin's development into living, recreational and leisure waterside space will open new perspectives for the inhabitants' lives, activities and economic situation.

1.5 Redevelopment of New Available Areas in the Abandoned River Basin

Areas formerly occupied by the river and now becoming available – located outside the newly created river bed – will be used for new purposes such as for instance:

1.5.1 Transport Routes

It is intended to build traffic lanes for motor traffic, bikeways and footpaths on the embankments at both sides of the river. These will be connected to the traffic routes existing in the communities located at the waterside. One lane into each direction might be adapted for the use of electric powered vehicles.

1.5.2 Cultivated Agricultural Areas

More than 10,000 ha of abandoned areas in the river basin will be used for agricultural purposes such as rice growing. Depending on respective cultures grown thereon (tomatoes), they might also be roofed and used for PV power generation. The respective areas' irrigation should be realized by installing efficient and yet water-saving systems.

1.5.3 Theme and Recreational Parks, Sports Facilities, Tourist Facilities

1.5.4 Animal Reserves

1.5.5 Green Pastures

This allows for transforming the rocky and sandy deserts in said North-East Italian river valleys (that can even be seen from outer space) to **"green pastures"** – in order to quote former German chancellor Kohl's comment on the fall of the Berlin Wall.

In times of agricultural land shortage, desert landscapes along riversides are nonsense.

The presented concept for river basin management can be appropriately summarized by using the term **"River-Room-Recreation"** ("RRR" in short).

1.5.6 The restructuring and cultivation of respective riverside areas also includes the utilization of renewable energy sources.

2 ELECTRICITY GENERATED FROM RENEWABLE ENERGIES

2.1 Photovoltaic – PV

2.1.1 Canopy-Shaped PV Roofing for Rivers and Channels

Rivers and shipping channels are supposed to be covered with solar film that is affixed to span roof-shaped steel framework structures. The bearer frame's supports will be piled in on both riversides and – with rather broad rivers – additionally in the river bed. The membrane roof is intended to feature a slope of 45 degrees and laterally stop at a height of 5 meters in order to ensure the snow's safe skidding into the river and unhindered view onto the water.

Rivers are continuous spaces (corridors), which makes perfectly suitable for pipeline routes.

The membrane covering's bearer frame might accommodate
- power lines for various voltage levels;
- supply and overhead lines for inland vessels powered by electricity; and
- lanes for overhead tracks.

■ **Danube-Tyrol-Adriatic Waterway – Project B –**

If the waterways on the Rivers Inn and Adige, from Passau at River Danube all the way to Venice, were roofed with film on a length of Adige 620 km (in the open), this would result in a film-covered surface of 62,000,000 m² (620,000 m length x 100 m width).
Assuming from a rate of 100 kWh/m², this will result in a nuclear power station's annual output of 6,200,000,000 kWh or

■ **an annual output of 10,000,000 kWh per km of waterway.**

2.1.2 PV Roofing for Roads and Freeways

It is furthermore intended to also cover roads and freeways with PV film in order generated solar energy. Suchlike roofing would be realized in the form described above.

■ **per each kilometer of road 1,200,000 kWh and**

■ **per each kilometer of freeway 4,400,000 kWh of electricity could thus be generated per year.**

2.1.2.1 Power Lines

Underneath said covering, power lines for various voltage levels as well as one overhead line for electric vehicles per each direction could run.

2.1.2.2 Positive Side Effects of PV Roofing or PV Canopy:

- ■ snow-free traffic lanes;
- ■ no formation of ice or hoarfrost;
- ■ no snow clearance, no use of de-icing salt or winter road sand required;
- ■ longer pavement life;
- ■ possible noise reduction;
- ■ unhindered view to both sides of the road.

2.1.3 PV Roofing for Sports Stadiums, Intensely-Used Agricultural Land or Wherever Roofing Facilitates Multiple Use

2.1.4 PV Elements Floating on Water Surfaces e.g. Uncovered Reservoirs.

2.2 Wind Turbines

In order to utilize the updraft created by the air heated underneath the roofing, wind turbines will be installed horizontally in the roofing's gables. However, since respective empirical values are not available, their output cannot be estimated.

2.3 Hydropower Stations at the Weirs

2.3.1 At the individual weirs, sub-aqueous turbine generator units will be installed to generate electricity by using the available water and differential. Running reversely (thrust reversal), these units serve to pump to the respectively next higher basin and – in the event of excess supply – take electricity from the mains and save it as renewable energy.

2.3.2 In order to compensate production and consumption capacities, high-pressure pump storage hydro power stations will additionally be built in order to especially compensate output peaks and to optimize the electric current's transport through the power line network.

2.4 Electricity for the Use of Electric Powered Vehicles

The plants for power generation and transport are positioned alongside said main traffic routes (waterways, railway, freeway, national and federal roads, bikeways) and are thus ideal to:

2.4.1 feed the grid for electrified lanes on freeways, roads and waterways;

2.4.2 directly operate high-performance quick charging stations for electric powered vehicles, provided at roadhouses and parking areas **(Park & Charge)**.

2.4.3 Furthermore, the electricity might be fed into the railway supply system since the power station will be built in its direct proximity.

3 ELECTROMOBILITY

3.1 On Freeways, Roads and Waterways

3.1.1 At least one traffic lane per each direction will be equipped with overhead lines for electric powered vehicles. The respective line will consist of two respective DC conducting wires of 700-1200 V voltage.

3.1.2 Without any drive unit or differential, the electric drive will be directly realized onto vehicles' wheels.

3.1.3 On non-electrified roads, rather heavy-weight electric powered vehicles will be supplied by integrated power generators, which might in future be partly replaced by high-performance batteries.

3.2 Traffic Guidance and Control System, Power Control System

It is furthermore intended to equip the power lines running above the traffic lanes (overhead lines) with a traffic guidance and control system.

3.2.1 The guidance system facilitates automated driving for higher road safety.

3.2.2 The integrated control system allows for integrating the electric powered vehicles with a highly efficient local and trans-European power control system.

Each electric powered vehicle (bus, truck), which is supplied from overhead lines on electrified lanes, can employ its integrated power generator with an output of approx. J 200 kWel within just seconds, feed any possibly oversupply back into the same overhead line and thus turn from power consumer to power producer. 10,000 trucks (for comparison: 6,000 trucks cross the Brenner Pass every day) can generate the power of 2 nuclear power stations - i.e. 2,000,000 kW – to support the power grid. Possible local grid overload could thus e.g. be addressed by engaging the auxiliary power units installed in electric powered vehicles traveling the respective region.

3.3 Overhead Railway (Aerobus)

3.3.1 The bearer frame of the roofing of rivers, channels or freeways might accommodate tracks for a **suspension light-weight cable railway** (Wuppertal suspension railway, which runs above the River Wupper, alternatively the model overhead monorail Aerobus). The railway might consist of a basic vehicle (carriage), which a car for the transportation of passengers or a container for the transportation of goods is mounted to from below.

3.3.2 The **channel tunnel's arch** (78 km) provides space that can't be used by respective ships and is thus available for an overhead railway.

3.3.3 Course of the route: up from the north portal east of Innsbruck, the line will pass via train station Hall in Tyrol (where the entire rail traffic in the directions north-south and east-west will be made accessible) and then run through the River Inn valley all the way to Passau at the Inn underneath the waterway's roofing. In Rosenheim, the traffic lanes might be continued inside the freeway's roofing all the way to **Munich** interchange located further in the north. Up from the channel tunnel's southern portal, the traffic lane might follow the roofing of River Adige via Verona all the way to Venice.

Tyrol-Adriatic-Project D

4 POWER AND DATA TRANSMISSION LINES

4.1 The roofing of rivers, channels, freeways and roads provides not only ideal conditions for power generation but also for transmitting different types of electric current of various voltages through power lines. This allows for the quicker expansion and/or improvement of the overloaded and insufficient public transmission and supply grid since no additional land is needed. Heading towards the lowlands, rivers become increasingly broader. Due to the stipulated pitch, the roofing will be increasingly higher. It consequently provides more space for electric current transport lines. At the same time, the channel tunnels underneath the main ridge of the Alps and the freeways across the Alps facilitate additional grid connections. The European electricity grid as well as the intra-community electricity market will thus be strengthened.

4.2 The respective lines also allow for feeding the European electricity grid with power generated by the Tyrol-Adriatic power stations - Project A. The high bottleneck output of 3.500 MW and the pump output of 2,000 MW result in a high standard output able to compensate the short-term failure of 2,000 offshore wind turbines. Therefore, said installations can be effectively used to control and safeguard the power supply.

5 TRANSEUROPEAN NETWORKS - T E N -

The Tyrol-Adriatic Projects meet the requirements for being incorporated in the TEN ranking. This applies in particular to:

B the Danube-Tyrol-Adriatic Sea Marine Passage;

C the electrified lanes for electric powered vehicles on waterways, channels, freeways and roads;

D the AC and/or DC power and data transmission lines spanning across rivers, waterways and freeways, which create perfect conditions for the interconnection of power grids and data lines in Europe.

6 FINANCING

6.1 With the proceeds gained from selling the real estate in hillside building complexes at the raised hills created from tunnel mining material:

6.1.1 at the north portal east of Innsbruck (Tirolcity);

6.1.2 at the south portal in between Gargazon and Vilpian (MeBoCity);

6.1.3 at the Garda portal south of Torbole (Gardacity), if the junction Adige-Lake Garda should be realized.

- Depending on the construction progress, said proceeds will be available as soon as one or two years after construction start. It is thus possible to finance a large part of the Danube-Tyrol-Adriatic Sea Marine Passage.

6.2 With the compensation gained from feeding in electricity generated for electric powered vehicles and not directly consumed by the same, i.e.:

6.2.1 by PV film covering on routes of roofed rivers, waterways, freeways, roads;

6.2.2 by the updraft power plants on roofing;

6.2.3 by the hydropower stations at the weirs of rivers and waterways.

6.3 By fees charged for using electrified traffic lanes on roads, freeways and waterways and respective power consumption.

6.4 By making more than 10,000 ha of land in former river basins available for agricultural use.

6.5 By fees charged for the use of parks, sports facilities, tourist attractions and leisure facilities located at the riverside and waterways.

6.6 The multiple use of channel tunnels and roofing of waterways, freeways and roads also allows for allocating the costs to respective forms of usage, i.e.:

6.6.1 PV power generation;

6.6.2 installation of tracks for lightweight overhead railways, road vehicles and watercraft;

6.6.3 transmission of data and electric current.

6.7 The synergies featured by the Tyrol-Adriatic-Project deserve special emphasis. For public institutions like old-age insurances and pension funds, banks and credit institutes as well as for private individuals, this project constitutes an excellent option for safe investments.

7 ENVIRONMENT

7.1 The PV roofing requires idle surfaces only.

7.2 Electricity for e-mobility will be generated directly on the PV roof above, by updraft turbines or hydropower stations as renewable energy. The 500 km of the Brenner route freeway crossing the Alps alone serves to replace 1,000,000 liters of fossil fuel by locally generated renewable energies every day.

7.3 The pollution mainly caused by heavy goods vehicle traffic especially on freeway routes leading through the Alps would abruptly reduce.

7.4 The guidance system integrated with the overhead lines facilitates improved traffic safety.

7.5 Electrified lanes offer the opportunity for private transport or battery-powered busses to drive in the respective lane and – by using a telescope-like current collector (pantograph) – to not only continue their journey being powered by electricity but to also recharge their batteries while doing so in order to gain more independence.

7.6 E-mobility serves to recover braking energy.

7.7 Power transmission lines run through the roofing. Transmission lines interfering with the landscape can thus be demounted.

8 THE FEASIBLE AND PROMISING CONCEPT OF THE TYROL-ADRIATIC PROJECT IS MORE THAN JUST AN ALTERNATIVE TO THE BBT

8.1 The intended **Brenner Base Tunnel**, together with its save and ventilation tunnels, is longer than the **channel tunnel from Inn to Adige**, running through the Alp's main ridge.

8.2 The railway base tunnel requires the construction of new access routes north and south of the BBT. Valleys and communities are thus separated and exposed to noise pollution, which is the reason why routing is also demanded for access route tunnels. This will result in additional routes that are several times as long as the BBT.

8.3 As high-speed line, the **BBT** is not qualified for mixed traffic. Traffic experts thus doubt that the BBT will serve to relieve the heavy traffic on the Brenner freeway. The common goods and passenger traffic would have to be transacted on the existing Brenner route as is the case by now. Consequently, any reduction of the environmental pollution caused by vehicle traffic – and in particular heavy goods traffic – is not in sight.

8.4 The rating of the railroad line Berlin-Palermo including BBT as TEN-T- EU scheme of priority took place in 2004, i.e. at a time when the <u>Tyrol-Adriatic Project concept (which generates the following innovations) did not yet exist.</u>

8.5 The **Danube-Tyrol-Adriatic Sea Marine Passage** creates the condition required to shift a large part of the goods in traffic between northern and southern Europe from road to inland shipping. **As an indirect result thereof, the environmentally friendly transportation of goods on Europe's waterways will increase as it will then be possible to travel also larger distances on inland waterways without any interruption and to access the Adriatic Sea, which is a gate to the southern parts of the world.**

8.6 The **lightweight suspension or overhead railroad** itself as advanced, safe and budget-friendly means of transport. It does not require any additional land, as it passes through the 78 km long Alpine Channel Tunnel and runs in the roofing above existing traffic routes such as waterways, freeway or in the open air above roads all the way into respective city centers. It can help to improve the quality of heavy goods traffic and might be a good **incentive to change from passenger car or even airplane** to this transport means. It will furthermore also be able to outperform the results expected from the BBT.

8.7 The use of electric powered inland ships, road vehicles or overhead railways will without a doubt cause enormous savings in fossil fuels and respective reductions in CO2 emission, noise pollution and pollutant loads – to a far greater extent and within less time as expectable from BBT and railroad.

8.8 <u>That means, before any further railway lines are built to cross the Alps, the first linkage between European inland waterways and the Adriatic and Mediterranean Sea should be established. Likewise, the Tyrol-Adriatic-Project with its Alpine Channel Tunnel should be realized instead of the BBT.</u>

8.9 The overall project will cause change, in particular with respect to a step towards more human and environmentally friendly traffic. Natural resources will be

incorporated and integrated with a concept and contribute to progress all across Europe.

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