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Current state of the European network of inland waterways of international importance

Note by the secretariat

I. Introduction

1. Presented below is the draft report on the current state of development of the European network of inland waterways of international importance, prepared by the secretariat as part of the White Paper on Efficient and Sustainable Inland Water Transport in Europe of the United Nations Economic Commission for Europe (UNECE). The text of this report is planned to be published as Chapter I of the White Paper in accordance with the table of contents approved by the fifty-third session of the Working Party on Inland Water Transport (ECE/TRANS/SC.3/183, para. 22). This report replaces the biannual report by the secretariat on the current situation and trends in inland water transport (IWT).

2. The focus of the report is on the inland waterways of international importance, as determined in the 1996 European Agreement on Main Inland Waterways of International Importance (AGN) and the 1997 Protocol on Combined Transport on Inland Waterways to the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC). Chapter II of the report gives a brief overview of the importance and the IWT performance in the ECE region over the past 10 years. Chapter III describes the European network of inland waterways of international importance as defined by the AGN agreement (the AGN network). The concluding chapter presents conclusions on policy trends and challenges for the development of the network.

II. Importance and Performance of Inland Water Transport in the ECE region

3. Half of the European population live close to the coast or to inland waterways and most industrial centres can be reached by inland navigations. Around 5.6 per cent of all goods transported in the 27 countries of the European Union (EU) are carried on inland water vessels (rail and road transport carry 72.5 per cent and 17.1 per cent respectively). This modal split for inland modes has dropped slightly during the past decade (1998: 6.4 per cent). In the Russian Federation, under difficult meteorological conditions, inland waterways account for around 4 per cent of total goods transport. In Ukraine this share is only 1.3 per cent. However, countries with all year open and efficient navigable waterways, particularly along the Rhine corridor, have considerably higher shares of freight transport by inland waterways, such as Belgium (14 per cent), Germany (13 per cent) and the Netherlands (44 per cent).

4. The two main international inland waterways in Western Europe are the Rhine and the Danube where around 208 and 73 million tonnes of goods were carried in 2008 respectively. On the extensive inland waterway network of the Russian Federation, around 150 million tonnes (2007) of cargo are carried annually.[1]

5. The EU IWT carried 143 billion t-km in 2008. Belgium (9 billion t-km), Germany (64 billion t-km) and the Netherlands (46 billion t-km) together accounted for more than 83 per cent of this traffic. In the Russian Federation, inland waterways registered around 64 billion t-km in 2008, down from 86 billion t-km in 2007. Other important IWT countries (in 2008) in the ECE region are Austria (2.4 billion t-km), France (8.6 billion t-km), Hungary (2.3 billion t-km), Romania (8.7 billion t-km) and the Ukraine (4.5 billion t-km).[2] In the United States of America, approximately 12 per cent of all intercity freight (excluding coastwise transportation) moves by shallow-draft barge. Another 4 per cent of intercity freight is moved on the Great Lakes, putting the total domestic waterborne transportation total at about 16 per cent. This freight is moved at only 2 per cent of the total cost of freight movements in the country.

6. Comparison of the results of IWT with the situation in 1990 as described in the 1996 UNECE White Paper on Trends on and Development of Inland Navigation and its Infrastructure (TRANS/SC.3/138) reveals contrasting trends. The most significant growth can be observed in Romania (+163 per cent), related to large-scale expansion and improvement of the port of Constanza and its satellite terminals at Midia, both served directly by IWT through the Danube-Black Sea Canal and its northern branch. The bulk of this growth is very recent and is linked to the end of the disruption of traffic on the Danube. The same applies to Bulgaria (+91 per cent), Croatia (+267 per cent) and Hungary (+83 per cent), yet with much smaller volumes. Then come the countries with stable networks and stable overall economic conditions applicable to IWT, which show substantial growth over this period: Belgium (62 per cent), France (39 per cent) and the Netherlands (25 per cent) are in the fore, while Germany shows stability (1 per cent) after having achieved higher growth than the other countries of the same group between 1990 and 1995. The high overall volume and the strength of this group are a good indicator for a continuation of IWT expansion, once the present economic and financial crisis is over. Altogether, these 4 countries account for some 60 per cent of total European IWT, including the Russian

[1] Information on freight transport by inland waterways (tonne-kilometers and tonnes) is presented in Figures 1 and 2 in ECE/TRANS/SC.3/2010/2/Add.1. (Due the limited space available, the tables and figures are published in the addendum to the report).

[2] More detailed information is available in Table 1.

Federation. The growth in Austria (27 per cent) relates both to the opening of the Main-Danube Canal and, lately, to the revival of through traffic on the Danube, while climatic and other factors influence the relatively small overall traffic in Finland (25 per cent) and Poland (-68 per cent).

7. As was already documented in the 1996 White Paper, traffic levels in all Eastern European countries showed a marked decline after their change from centrally planned economies to the new “free market”. This shows in the figures for the Czech Republic (-86 per cent), Lithuania (-50 per cent), Poland (-68 per cent), Slovakia (-32 per cent), the Russian Federation (-60 per cent), Serbia (-51 per cent) and Ukraine (-93 per cent).The situation has turned around and increases are observed today in practically all of these countries. The decline observed in Italy, Switzerland and the United Kingdom of Great Britain and Northern Ireland does not reveal any significant trend, since the traffic concerned – and the distances covered – are relatively small.

8. In 2009, transport performance on European inland waterways declined in the order of 15 to 25 per cent due to the economic and financial crisis that hit particularly the steel industry and led to a severe reduction in transport demand for coal, iron ore, metal products, but also for port hinterland transport of containers.

III. European Inland Waterways of international importance (the AGN network)

9. Given the disparity in terms of IWT use in the different parts of the ECE region, the next sections will examine the following subnetworks of the AGN network:

A. Rhine-Danube network (14 362 km or 47.6 percent of the total length of the AGN network (30 177 km));

B. Russian Federation-Ukraine centred network (9 339 km or 30.9 percent);

C. Baltic area (840 km or 2.8 percent);

D. Czech-Slovak centred network (715 km or 2.4 percent);

E. Rhône-Saône basin (679 km or 2.3 percent),

F. Seine-Oise basin (632 km or 2.1 percent); and

G. Costal routes and connected inland waterways (2 774 km or 9.2 percent).

The AGN breakdown in subnetworks is presented in Figure 3.[3] The parameters applicable to inland waterways of international importance, specified in Annex III of the AGN agreement, are recalled in Table 2.

A. The Rhine-Danube network

10. The Rhine-Danube interconnected network (routes E 10,E 80,E 70,E 20,E 30) became a reality in 1992 with the opening of the Main-Danube Canal, linking routes E 10 (north-south) and E 80 (east-west) (Figure 4). This part of the network represents nearly half of the total length of AGN waterways and breaks down into the following waterway classes: Classes V-VII (8 913 km), Class IV (2 813 km) and Classes I–III (2 636 km).[4]

[3] 836 km or 2.8 per cent account for the waterways not assigned to any region.

[4] These figures are on the UNECE Inventory of Main Standards and Parameters of the E Waterway Network (“Blue Book”) (ECE/TRANS/SC.3/144/Rev.1).

11. More than a third of these inland waterways are below the standards of the AGN network (i.e. below class IV) – from the point of view of vessel capacity and, incidentally, also in terms of suitability for combined transport. Looking at the network and its performance in more detail, it is important to underline that there remain substantial differences in the quality of the infrastructure East and West of the Bavarian watershed, and this has an impact on the development of traffic, in addition to economic, political and regulatory factors. The essential – and durable – difference between the networks East and West of this divide lies in the character and density of the network.

1. Infrastructure

a) Rhine basin

12. The Rhine basin is evidently the most developed, maintained and utilized for the transportation purposes part of the AGN network. It is characterized by the highest population and waterway density and its share of the upper classes of inland waterways is considerably higher than on other European inland waterways.[5]

13. Infrastructure projects in the Rhine basin and East across northern Germany to Poland and the Baltic countries essentially aim to eliminate strategic bottlenecks and to increase the carrying capacity on routes converging on the Rhine. Project on the Mittelland Canal route (E 70), for upgrading to class Vb, has been completed through to Berlin. It is now being followed up with the enlargement at Niederfinow by construction of a new barge lift. Work is ongoing on doubling of the locks on the Moselle and increasing its carrying capacity by deepening the channel for vessels drawing up to 3 m. The Rhine basin will soon acquire further density, improved operating conditions for carriers and new possibilities of supply, especially in combined transport, by implementation of the Seine-Scheldt waterway project, including the 106 km long Seine-Nord Europe Canal (E 05, class Vb). The canal will provide a link from the Rhine basin to the currently isolated western part of E 80 and E 80–04. In the near future (2015), this isolated network will therefore become a subnetwork of the overall interconnected system.

14. A weakness of the existing main network regarding interconnection with the new EU member States east of Germany is the poor overall condition of the inland waterways throughout Poland, i.e. route E 70 east of the Oder. Waterways of international importance (classes IV and Va) represent only 1.9 and 3.0 per cent respectively of the total length of 3650 km of waterways in this country. The Polish Government identifies all the main routes (E 30, E 40 and E 70) as "basic bottlenecks" where upgrading from Class I, II or III to Class Vb is required, but there is at present no indication of such projects being on the agenda of the Polish Government. Poland holds the key to interconnection with the at present distinct "Five Seas" network centred in the Russian Federation, through the river Bug, but free-flow navigations pose serious problems of variable hydrological regimes and available depths. Moreover, environmental protection lobbies oppose major engineering works (whether free-flow or canalization). In this context, investment decisions are taken in some countries on the assumption that neighbouring countries will eventually make compatible infrastructure investments as per AGN Agreement, to provide a coherent overall network. Less critical to the development of traffic is the E 70 "missing link" (Twente to the Mittelland Canal), which is included in the AGN, but is qualified as a long-term project.

[5] PINE Study "Prospects of Inland Navigation within the Enlarged Europe" (Concise report) (September 2004), p. 21.

b) Danube basin

15. By contrast, the issues on the Danube relate to the intrinsic navigability and carrying capacity of the river itself and its tributaries and connecting waterways. Hence the strategic bottleneck of limited draughts in the Straubing-Vilshofen section of the Danube (currently guaranteeing no more than 1.55 m draught), and other sections offering less than the required 2.50 m in Romania/Bulgaria, Serbia and Hungary (for a variable number of days in the year, 7–15 in some cases, but up to 2 months or more). Eliminating these bottlenecks is the aim of the EU Priority Project 18 under the trans-European transport network (TEN-T) programme. The project aims to establish uniform characteristics throughout the 3000 km long waterway from the North Sea to the Black Sea. Figure 5 highlights the critical sectors on the Danube in terms of its carrying capacity, identified by the Danube Commission (DC). In the 2010 working documents on the main directions on its nautical policy, DC stressed that the major infrastructure works are required to qualify the entire waterway as part of the E-waterway network, as defined by the AGN agreement.

16. Possible solutions are examined in a study involving all major stakeholders, including representatives of the transport sector and environmental groups. Works are already under way in the Austrian section of the Danube. The situation in Romania and Bulgaria is different as the countries are dealing with the application of the EU environmental regulations. The Straubing–Vilshofen project can be seen as representing a unique opportunity and a truly European project, to establish high-quality inland navigation infrastructure between the North Sea and the Black Sea.

17. The contrast regarding network penetration between the Rhine and the Danube basins is also pronounced, considering the very poor conditions of navigability on all the tributaries of the Danube, none of which provides service as “feeders” of the artery in the way that the canalized Moselle, Main, Neckar, etc, effectively “feed” traffic to the Rhine. The Sava to Sisak in Croatia is a basic bottleneck. Upgrading to Class Vb is the objective, but even the present Class III limit is not attainable for long periods. The Tisa in Hungary is not even included in the AGN. The Váh in Slovakia is, like the Sava, a basic bottleneck with major infrastructure works required in the lower section connecting with the Danube. The Morava offers no potential for free-flow navigability. Accordingly, the Danube functions as an artery without branches, with the limitations that are implied.

18. A significant exception would be the Danube-Bucharest Canal in Romania (E 80–05), where the works interrupted in 1990 have recently resumed. In this context the Danube-Oder-Elbe missing links are also potentially of great importance, including the possible first phase consisting of a “branch” from the Danube to an inland port in Moravia at Břeclav. In the current situation, many factors thus combine to make the Danube side of the pan-European AGN network less efficient for IWT than the Rhine basin west of the Bavarian divide.

2. Fleet

19. The imbalance in terms of infrastructure between the Rhine and the Danube also applies to the fleet, since the vast majority of vessels operating on this network belong to the Rhine fleet. The analysis made on the rather restrictive definition of International Vessel Registration (IVR) criteria, gives a total of nearly 9 000 goods-carrying boats, all certified for plying on the Rhine (“jauge du Rhin”, Rhine Survey).[6] Some more boats are

[6] A large proportion of the French fleet is Rhine compliant (‘certificat du Rhin’), yet for some reason these vessels are not recorded as such in the IVR data base. Some 500 craft could be added in this way.

counted by IVR as "national fleets", amounting to 4603[7] more, with 4.2Mt capacity. The Danube fleet in 2007 amounted to the total of 3 962 inland vessels.[8]

a) Rhine fleet

20. The first observation about the Rhine fleet is the rise in average size with the periods of build. Before 1970, the average size was class II barges (up to 1960), then class III. Later, from 1970 to 1999, the average was around class IV, then further increasing to class V in the last decade. The number of vessels in this later class almost doubled over a period of a few years.[9] While they represent 4 per cent of the number of craft, vessels of 3000t or more aggregate 17 per cent of the capacity, and craft between 2000 and 2999t total 30 per cent of the capacity, with only 14 per cent of the fleet. The acceleration of this trend is revealed by the years of build: while in the 1980s craft of 2000t and more represented hardly 30 per cent of the new builds, from 1990 onwards it was 49 per cent and 67 per cent, with respectively 75 and 85 per cent of the capacity. This is a deep-seated trend, and appears unlikely to stop. 1970 was clearly a turning point: since that date, very few craft of less than 400t have been built. Yet, due to the very long life of IWT craft, the structure of the fleet will evolve slowly in time.[10] As demonstrated by Figure 6, the period 1950–1969 towers above the rest: it is the period of reconstruction and the beginning of push-towing. By contrast, the period 1990–1999 shows a significantly reduced rate of renewal of the fleet.

21. Another noticeable variable is the length of the vessels on the Rhine.[11] A major breakthrough has occurred in this area since the publication of the 1996 White Paper. Starting from 1996, self-propelled craft 135 m long were authorized in the Rhine basin, and a number have been built, leading to the steep rise in average capacity as observed above. However, this creates a new category of boat, which could be termed Vb and which cannot use 110 m long locks (class Va).[12] Craft between 76.75 and 85.74 m belong to Class IV (RHK, or Johann Welker). Since 1970, they have been replaced as the most common boats by Class Va craft (from 85.75 to 110.74m).[13]

22. Another point of interest is the split between self-propelled craft and dumb craft. For decades, most boats were towed, then self-propulsion came in, mostly after the World War Two, while, starting from 1959, conventional towage was rapidly replaced by push-towing, a much safer and more efficient technique. Self-propelled barges dominate the picture,

[7] 1044 craft registered in Belgium, 1532 in France, 250 in Germany, 1759 in the Netherlands.

[8] Main indicators on the navigation on the Danube in 2007, the Danube Commission.

[9] This can be seen in the Tables 3 and 4 on the number of the Rhine fleet by year of build and size and its capacity by year of build and size.

[10] A very recent and slightly contradictory trend is the "barge truck" concept currently being developed in the Netherlands, whereby smaller units are engaged in consignments destined for inner-city locations on waterways of limited capacity. This is mentioned for reference, but it could eventually slow down or counteract the deep-seated trend revealed by statistics from 1970 to 2008.

[11] As shown in Table 5 on the number of craft by year of build and length and Table 6 on its capacity by year of build and length.

[12] There are several such locks in France (Clévant on the Moselle/Meurthe, St Maurice, St Maur on the Marne, Créteil, Bellerive and Janville on the Oise lateral canal), many in Belgium (Scheldt, Leie and Sambre waterways) and the Neckar in Germany, among others. Furthermore, they cannot use the existing turning basins on many waterways, designed for 110 m long craft or short push-tows, and acceptable for all long push-tows when split. Finally, few terminals are long enough to accommodate them under satisfactory conditions.

[13] The fact that some craft older than 1996 exceed 110.74 m is explained by lengthening or jumboisation, a procedure which is becoming common.

since they total 60 per cent of units and capacity in the Rhine fleet.[14] Since push-tows aggregate a number of barges, they can move large quantities of cargo, yet with smaller unit loads. It is more important that the barges (or lighters) should be of the same size, and this standardization concept has had a restraining influence on the move towards larger barges.[15]

23. However, a move towards 110 x 11.4 m barges, in parallel to 135 m self-propelled craft, is to be observed (30 units). There are only 49 barges with lengths between 90.75 and 109.74 m, which leaves 155 barges between 85.75 and 90.74 m. These are indeed small numbers compared to the Europa II type (76.5 x 11.4 m) lighter which totals some 579 units, and its lengthened versions, up to 85.74 m long (182 units), which has become the reference, displacing the Europa I type (70 x 9.5 m), of which there remain only 43 units.[16]

b) Danube fleet

24. The strength of the Danube fleet, as described by Danube Commission Statistics, has markedly grown from the 1970s (+36 per cent), yet has reduced since 1990 and its peak of 5Mt. In 2007, the cargo and passenger fleet on the Danube amounted to the total of 4 105 vessels, which represents a two percent increase since 2006. The total capacity of the Danube fleet in 2007 was 3.84 Mt. Figure 7 shows the evolution of the fleet capacity by country and Table 11 reflects the evolution of the total capacity of the fleet over the years.

25. The vast majority of the fleet is pushed barges, rising from 30 per cent of total capacity in 1970 to 68 per cent in 2005. Modernized Europa–II type barges will remain the main type of non-self-propelled vessel for container transport on the Danube over the next few years. The share of conventionally towed craft has been reduced by more than half over the same period, with the decline more marked since the year 2000. They still represent 18 per cent of the capacity. Besides, they are sometimes lashed alongside pushed convoys, which is clearly the dominant technique. Self-propelled craft, contrary to the Rhine, are still a minority, around 14 per cent, and this is not evolving.

3. IWT Performance

26. The widely varying characteristics of the waterways across the network, from the Lower Rhine and Albert Canal (9000 tonnes) to "branches" E 20 and E 30 often limited to 1000 tonnes, result in substantial variations in the price of IWT solutions.

a) Rhine

27. On the Rhine, traffic in 2007 increased by 2.6 per cent and this growth involved largely the agricultural (4.6 per cent) and the metallurgic (15.7 per cent) sectors. The demand had been particularly strong for the transport of dry goods (4.4 per cent). At the same time, the Rhine navigation only moderately (+2.2 per cent) benefited from the general growth of the transport of containers. Moreover, the tanker transport decreased in 2007 by 3.5 per cent, due to the general decrease (10 per cent) in the transport of oil products.

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[14] This is reflected in Tables 7 and 8 on the number and capacity of the self-propelled Rhine Fleet by year of build and length.

[15] Furthermore, it may be advantageous to combine in the same tow goods of different kinds, bringing economies of scale even to small consignments. Thus the average size of barges has not grown substantially, remaining on average well below 2000t. The "100 m long/14 m wide" barge which was widely envisaged as the "vessel of the future" in the 1980s has not caught on, and remains anecdotal (1 unit).

[16] The detailed information is contained in Tables 9–10 on number and capacity of the Rhine barge fleet by year of build and length.

b) Danube

28. On the Danube, the total volume of the transport of goods in 2007 reached the level of 80.6 million tonnes, which represents 10.1 per cent increase since 2006. The traffic between the Danube ports represents the 71 percent of this traffic. The overall traffic of goods through the major ports on the Danube increased by 5.4 per cent during the period 2004–2005 (54 Mt and 57 Mt in 2004 and 2005, respectively). The transport of agricultural products represents over 80 per cent of this traffic.

B. Russian Federation-Ukraine centred network

29. The most structured and uniformly developed subnetwork of the AGN network is formed by the E 50 waterway in the Russian Federation, along with the Belomorsko-Baltijskiy canal, the section of the Don river from Azov to Kalach and the Volga-Donskoi navigation canal[17], associated with route E 40 in Ukraine (Dnepr to Kiev and Belarus). It is logical to consider the waterways of Ukraine as belonging to this interconnected network, in view of the reality of river-sea shipping services via the Black Sea. (Figure 8).

30. This network presents uniform characteristics as 88 per cent of the total length is open to deep-draught river-sea shipping, and sub-standard (Class III) waterways represent less than 5 per cent of the length (the “branches” formed by the Dnestr/Nistru and Desna rivers).

1. Infrastructure

31. Infrastructure issues break down into two categories: those internal to this network, and those which determine its “interconnectedness” with the rest of the AGN network.

32. Within the network, there remain two strategic bottlenecks : the lowest section of the river Don (E 50) at Kochetov lock, owing to the the limited sill depth at that lock (3.60 m) and restricted width (17 m instead of 18 m) and on the Volga (E 50) from the Gorkovsky hydroelectric complex to Nizhny Novgorod, owing to the insufficient draught on the approach to Gorodetsky lock.[18] The Volga-Don Canal does not qualify as a strategic bottleneck, but the planned construction of second lock chambers at each of the 9 locks by 2020 gives it the equivalent status. It may also be qualified as such in view of the interest expressed in Kazakhstan and neighbouring Asian countries in developing river-sea transport solutions through the Caspian Sea and the Black Sea to the Danube basin and the rest of Europe. Increasing the capacity of the Volga-Don Canal by doubling of the locks could contribute to fulfilling this objective.

33. Interconnection with the rest of the AGN network depends on the following missing links: the link to the main network through Poland, and the E 40 (or E 41) missing link itself (Baltic-Black Sea Waterway). Regarding the link west to Poland, the waterway runs from the Ukrainian border near Chernobyl through Belarus to Brest at the Polish border (via the river Pripyat and the Dnieper-Bug canal). It is a class IV inland waterway, but some structures of the canal have deteriorated and no longer meet modern environmental requirements. Belarus is therefore building new locks here to meet the standards of a class Va. Four gated weirs and two locks have been built, allowing the passage of vessels 110 m long, 12 m wide and with a draught of 2.2 m. Work is still in progress. On the other hand,

[17] This includes the integral parts of the E 60 coastal route from Gibraltar to Saint-Petersburg and on to Arkhangelsk and of the E 90 coastal route from Gibraltar to Azov and Astrakhan.

[18] Although this is not an absolute restriction but a time constraint, the nominal draught being available at present for 2–3 hours per day.

there is no project in Poland, and this is likely to remain a missing link for the foreseeable future.[19]

34. The Russian Federation completed the second lock at the Kochetovsky hydraulic complex on the River Don in 2008. Substantial dredging projects on the Volga-Baltic waterway, aimed at restoring the waterway's parameters, are to be completed in 2014.[20] The strategy for "developing the transport system of the Russian Federation, 2010–2015" includes major investment projects to eliminate bottlenecks on the unified inland navigation system of the European part of the Russian Federation: a new low-head hydraulic complex at Nijniy Novgorod on the River Volga, and construction of a second parallel lock at Nijne-Svirski hydraulic complex on the River Svir of the Volgo-Baltijskiy waterway. Major repairs and replacement works are also planned on the Moscow Canal. The overall strategy covers both the unified inland navigation system of the European part of the Russian Federation and the waterways of Siberia and the Far East. Second chambers are planned at all the locks on the Volga-Don Waterway, to be completed by 2020. Investments to develop port infrastructure on the Russian AGN waterways include the construction of new terminals and infrastructure in the port of Azov, which would accommodate all types of "river-sea" vessels and increase the port's annual handling capacity by 6 Mt. It is also planned to develop a system of vessel traffic management and information support for all Russian inland waterways.

2. Fleet

35. In 2008, there were 28 200 vessels listed in the Russian River Register, including 1066 river-sea vessels and 107 newly constructed vessels. In 2007, over 2000 license-holders carried out shipping activities; 43 vessels were refurbished. At the end of 2006, there were 806 vessels[21] in the Ukrainian inland navigation fleet, including 54 tankers and 752 dry cargo vessels. Modernization of the fleet is a requirement in all countries on this network, including Kazakhstan on the eastern side of the Caspian Sea. This is inevitably a long process, and it will take many years before these countries have fleets entirely conforming to modern environmental and economic standards. In Ukraine there are plans for a vessel in the dry-cargo estuary vessel class, with a capacity of between 5000 and 6000 tons and a draught of 5.5 m, to be used for "river-sea" traffic through the estuary ports on the Dnepr (Kherson), Pivdenny (or Yuzhne) Buh (Mykolaev) and Danube (Ismail, Reni). As already mentioned, such craft will not count in the statistics for IWT craft, since their draught clearly places them in the category of coasters, not river craft.

3. IWT Performance

36. Every year, Russian IWT carries some 130 to 140 Mt tons of cargo, representing 80 to 90 billion t-km, passenger-kilometres. As mentioned before, IWT accounts for about 4 per cent of freight transport in the country, but in certain segments of the market its share is quite substantial, e.g. over 80 per cent of cargoes delivered to districts in the Far North. The volume of cargo carried by IWT in the Russian Federation in 2007 was 152.4 Mt (an increase of 9.5 per cent over 2006), and 83.7 billion t-km. Domestic movements accounted for 131.3 Mt (12.4 per cent more than in 2006), and international movements 21.1 Mt. In

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[19] The Baltic-Black Sea waterway was considered by the forty seventh session of the UNECE Working Party on Inland Water Transport in 2003 for its possible inclusion in the AGN, but no positive decision was reached. It should be noted, however, that the most serious bottleneck for the foreseeable future is the radioactive fallout following the Chernobyl disaster, which restricts commercial navigation through the 30 km exclusion zone.

[20] See the 2008 report by the UNECE secretariat (ECE/TRANS/SC.3/2008/1/Add.1).

[21] Passenger vessels are excluded from the analysis, as throughout this report.

2007, Russian river ports handled 225 Mt of cargo, 17.6 per cent more than in 2006; this included 17.5 Mt of exports, 1.4 Mt of imports and 206.6 Mt of domestic cargo. Handling of exports increased by 21.7 per cent, of imports by 14.3 per cent and of domestic cargo by 17.3 per cent. The growth in domestic IWT in 2007 is explained by a longer navigation season in the river basins and an increase of 12.5 per cent in the absolute volume of dry goods carried (principally cement, metals, timber and building materials), and also by an increase in the transport of timber rafts. Under the 2003 outline plan for the development of IWT preparations are being made to open Russian inland waterways (the east-west route from Azov to Astrakhan in 2007 and the north-south from Volgograd to Saint-Petersburg) to vessels flying foreign flags.

37. In Ukraine, the volume of cargo carried by IWT has been regularly increasing since 2000, but the latest figure (14 million tons in 2006) is still far short of the 1990 level of 66 Mt. It represents a modal share of only 0.8 per cent in tonnage, and 1.3 per cent of the 6.3 billion t-km.[22] These figures remain well below the potential of inland navigation. In fact, between 1990 and 2000 the volume of cargo transported in Ukraine by inland navigation decreased more rapidly (-87 per cent) than the corresponding figure for all cargo (-75.4 per cent). However, all the decrease occurred before 1995, and starting in 2000 and for the following six years, IWT grew more rapidly (by 69 per cent) than transport overall (19 per cent). This reflects the concern in recent years to develop a particularly advantageous mode of transport. To increase the volume of cargo carried on inland waterways in domestic and international (including transit) carriage, besides adding inland and sea-river vessels to the national fleet and encouraging domestic vessel construction, planned measures include reserving cargoes for Ukrainian carriers (quotas), refining the State regulation system to make the domestic fleet more competitive and setting economic conditions to stimulate the carriage of goods in transit.

C. The Baltic area

38. The Baltic area consists of northern part of E 40, eastern part of E 70 and E 41, the possible Baltic-Black Sea waterway (Figure 9).

1. Infrastructure

39. Planning essentially concerns the gradual improvement of the Nemunas/Neman river navigation from Kaliningrad and Lithuania inland to Kaunas, which is the designated limit of route E 41. Plans are relatively modest, however, since they involve increasing the draught to 1.60 m. Kaunas dam prevents development of navigation beyond Kaunas towards Vilnius or Belarus, and there are currently no plans to bypass this obstacle.

40. The concept of a Baltic-Black Sea waterway, whether by extension of this route E 41 or by development of the Daugava river inland from Riga, therefore remains hypothetical at present, in the absence of any support from the respective Baltic States of Lithuania and Latvia. Belarus is thus alone in promoting this waterway connection.

41. It should be noted that the Daugava (not on the AGN network) presents conditions of free-flowing navigability that are comparable to those of the Nemunas illustrated here (downstream of the dam), and those of the Polish rivers. All these rivers are blocked by ice

[22] As a general note of caution regarding the statistics of the former Soviet republics, they often include t-km carried on foreign soil or at sea by the national fleets, which departs from the general methodology agreed upon by UNECE, and makes comparison somewhat difficult. Besides, some t-km may be counted twice, by the country of the carrier and by the country where the carriage takes place. This also occurs on the Danube.

many months per year. Only a deep-seated change in the conditions surrounding transport policies and environmental protection of rivers could give rise to a change in the prospects for this subnetwork, which is unlikely to evolve in the medium term.

42. Only very limited investments have been made in recent years on this network, which concerns two countries: the Russian Republic of Kaliningrad and Lithuania, essentially concentrated on the seaports and their approaches. Integration of this subnetwork with the main network depends on investments on basic bottlenecks in Poland.

2. Fleet

43. The fleet engaged in IWT in this area is negligible in Kaliningrad and Lithuania. In Poland it amounts (in 2007) to 107 self-propelled barges, average capacity 600 t, and 428 barges for push-tows, average capacity 500 t. This fleet operates on those Polish waterways that are interconnected with the German waterways and the Rhine basin. The relatively low deadweight relates to the current characteristics of the Oder and the Oder-Vistula Canal. In this subnetwork east of E 70, in view of the restrictions on depth in particular, waterborne traffic accounts for a very small proportion of freight movements: less than 1 per cent of inland freight movements in Poland, for example. The percentage is negligible in Lithuania, Latvia and the Russian territory of Kaliningrad.

3. IWT Performance

44. This is the subnetwork which carries the least traffic. The reason lies in the basic parameters coupled with severe draught restrictions on the free-flowing rivers. In fact, waterways below international standards represent 50 per cent of the length of this subnetwork.

D. The Czech-Slovak centred link

45. At the geographical core of the European waterway network and the AGN are the Czech and Slovak Republics, which have what can be seen as the most critical strategic bottlenecks, in the lower reaches of the river Elbe near the German border, and the most obvious missing links.[23] This part of the network consists of routes E 20 and E 30 and southern extension, and E 81 (Figure 10).

1. Infrastructure

46. The priority for the Czech Republic is the improvement to navigation on the free-flowing river Elbe between the German border and Ústi nad Labem, where two relatively low-head dams (less than 6 m) and hydropower plants, with locks 200 by 24 m, are projected. The works are essential to provide the same draught as that available on the German side of the border. Development of inland shipping is seriously limited in the present situation, with available draughts of as little as 90cm in low flow periods (compared to 1.30 m on the free-flowing Elbe in Germany).

47. The extension of routes E 20 and E 30 and connection south to the Danube make up the ambitious Czech project for the “Meeting of the Three Seas” (North Sea, Baltic and Black Sea). The project dates from 1901, and was originally to be completed by 1924. Until recently, the Czech Republic did not support the implementation of this project. However, in July 2009, it adopted its spatial development policy which recognized the need to develop waterways in the country in the next decade. Priorities were defined as the river

[23] Missing links E 20 and E 30 are essentially within the Czech Republic. The Váh-Oder Link (route E 81) is an alternative project which is still under consideration by Slovakia.

Elbe and Vltava, but provision is also made for possible implementation of the Danube-Oder-Elbe (DOE) “water corridor”. The Government adopted a resolution which laid the basis for thorough examination of the need for these missing links at the international level. Specifically, it intends to discuss the path of this waterway with representatives of Austria, Germany, Poland, Slovakia and the European Commission, as well as other signatories of the AGN. These discussions are expected to lead to an international assessment of the possible construction, transport efficiency and investment demands for individual sections of the DOE water corridor. The results of this new approach to the project will be presented to the Government by the end of 2010 for subsequent decisions.

48. All investments in the network have been blocked in recent years. Short-term investments concern the Elbe and Vltava, in particular the badly-needed lock and weir at Decin, without which cross-border barge traffic with the port of Hamburg is stopped during low-water periods. Some of the investments planned in the short term are on smaller waterways, such as the upstream part of the Vltava and the Morava connected to the Bata Canal (both Class I). Both of these projected investments would be of value for waterway tourism rather than modern waterborne freight movements, and both are disconnected from the DOE water corridor project itself.

2. Fleet

49. The Czech fleet is made up of 68 self-propelled barges and 249 barges for push-tows, with respective average capacities of 900 tonnes and 500 tonnes. All are currently engaged mainly in the limited domestic traffic, while the economic feasibility of transnational movements is seriously affected by the limited depths as indicated above.

3. IWT Performance

50. Traffic has been very erratic, despite the high-quality infrastructure in the upper reaches of the Labe/Elbe, because of low waters in the Labe/Elbe as outlined above. Extreme floods have also brought difficulties, by the damages inflicted to embankments and training works, and some of the worst have taken place recently.[24] Besides, part of the traffic between Hamburg and Prague moves by waterway up to Dresden, and then crosses the border by road. This can be explained by the fact that depth on the first 40 km of the Czech route is 0.4m less than in the German part, making it very unprofitable to proceed upstream.

E. The Rhône-Saône basin

51. This small isolated network consisting of route E 10 (south) offers excellent conditions for development of IWT in the hinterland of the ports of Marseilles-Fos and Sète, through to Lyon and the inland port of Pagny near Dijon.

1. Infrastructure

52. The Rhône-Saône waterway network offers characteristics compliant with the AGN and with the standards for combined transport, with limited works to be completed to guarantee the required depth on the Saône and the required cross-section on the Rhône-Sète Canal. (Figure 11).

53. The difficulty of developing IWT to its full potential on this subnetwork lies in its isolation from the main network. Official policy from the early 1990s was to focus on the Seine-Nord missing link, thus designating the E 10 link as lower priority. The Rhine-Rhône

[24] Three epoch-making floods took place in 2002, 2006 and 2007, with smaller peaks in 1997 and 2010.

project which had been planned since the late 1960s was then abandoned in 1997. After a few years of limited planning activity, the French Government, the Regions (led by Lorraine and Rhône-Alpes) and the national public corporation "Voies Navigables de France" (VNF) resumed studies of the link, justified by a common awareness of the restricted value of 30 years of intensive investments on the Rhône and Saône in the absence of this link.

54. As indicated above, only limited works remain to be completed to obtain full Class Vb characteristics throughout this subnetwork, and Class dredging in certain sections of the Saône, and widening and deepening of the channel of the Rhône-Sète canal, to Class IV capacity.

2. Fleet

55. The fleet specific to the Rhône-Saône basin is comprised of boats that are wider than 5.10m, or narrow enough but longer than Freycinet locks (38.5x5.20m), making it captive in the basin because every route out of the basin is Freycinet size. Presently, it totals 215 400 t and 152 boats, out of which 134 boats, totaling 209 600t, were operating in 2008. The public transport part is regularly reported by VNF, while there are some 57 more boats in private carrying of sand and gravel which are also captive. (Table 12)

56. A first noticeable point is the very high average size of the fleet, nearly three times that of the French fleet overall. This is understandable, since all Freycinet-type barges, which lowers the average, are excluded, because they are not captive. Furthermore, the own-account fleet is not included in the statistics, and its average size is much lower (571t). This is driven by a logistics logic, a sand port needs only the amount of construction materials that it sells in a day, which is hardly 500t in France. Serving it with 2000t barges would unnecessarily freeze a large investment to serve as floating storage, and no operator does this. The size and capacity of the fleet grew enormously in the last decade, in line with the growth of traffic.[25]

3. IWT Performance

57. The growth of the Rhône-Saône fleet has been fuelled by the growing container traffic, and the numerous barges and self-propelled craft assigned to it. This is clearly a sector with a future, irrespective of local or global crises. On the other hand, the decline in the tanker fleet is noticeable. This results from two opposite trends: the release for civil transport of a NATO pipeline reduced drastically the amount of petroleum products to be carried, and led to the phasing out of many tanker vessels; new markets opened, particularly in chemicals and gas transport. The recent expansion in this sector has been accelerated by the pending obligation to operate vessels with double hulls for transport of dangerous goods; this has been taken as an opportunity to win new markets, with some success, thanks to the increased security it offers.

58. Prices offered, in comparison to rail, are broadly equivalent for regular volume traffic. Accordingly, the competition is fierce, but there have already been some cases of cooperation in order to stop cut-throat competition.[26]

59. The growth in demand was estimated in the context of studies of the possible Saône-Moselle link (E 10–02). These concluded (in 2005) on three possible scenarios of evolution of demand on the route, analysing all road traffic between the French *départements* on the

[25] Detailed data is presented in Figure 12.

[26] For instance, the Edouard Herriot port on the Rhône in Lyon is an advanced port of Fos/Marseille for both IWT and rail, with similar prices applied.

waterways situated south of the new link and all the *départements* on the waterways to the north of the link, plus Belgium, the Netherlands and the Rhine basin in Germany. Under the scenario most favourable to inland waterways (blue scenario) the potential annual traffic could reach 15 Mt.

F. The Seine-Oise basin

60. This part of the network includes route E 80, west, and missing link north to E 10. (Figure 13).

1. Infrastructure

61. The Seine-Oise waterway network offers characteristics compliant with the AGN and with the standards for combined transport, with limited works to be completed to guarantee the required depth on the Saône and the required cross-section on the Rhône-Sète Canal.

2. Fleet

62. The number of craft isolated in the Seine-Oise Basin is around 500 (craft wider than 5.8 m). The only connection at this size is Canal du Nord (6 m wide locks), all other canals being Freycinet type, with 5.2 m wide locks. A large share of the fleet is pushed craft, due to the importance of aggregates traffic towards Paris. The average size is larger than the overall French fleet, since there is no Freycinet craft (<400t). (Figure 14).

63. Some new craft are inducted into the basin from time to time, passing through the sea or carried on submersible barges, both ways being costly. In particular, there were a few 135 m craft, specialized in container transport, brought in this way. Yet, fleet owners are wary of the coming Seine-Nord Europe link, which will enable a complete fluidity of the North-West European fleet and may bring in the Seine basin many craft attracted by higher freight.

3. IWT Performance

64. Prices are a little high compared to those on the Rhine, but this is offset by the less severe competition from rail as in other parts of Europe, because most of the tracks are overloaded with passenger trains around Paris. Competition is fierce with road transport, however, especially on account of the circuitous route taken by the Seine to reach the sea: 330 km from Gennevilliers near Paris, while it is less than 200km as the crow flies. Yet it retains an appreciable share of the traffic, better than the French average, because of the quality of this deep waterway (3.5 m draught). In 2000, 90 Mt of non-containerized freight and almost 320 000 containers (TEU) were transported on the north-south corridor to be served by the Seine-Nord Europe project.

65. The modal share of road transport, which has the dominant market share (87 per cent versus 8 per cent for rail and 5 per cent for water transport), is explained by saturation of the railway network as indicated above, but also by the absence of interconnection of the high-capacity waterway network. The presence of high-capacity waterways has a major impact on the market share of IWT. On sections where high performance is possible, such as on the Seine, water transport has a significant market share (13 per cent of the movements studied). On the other hand, the constraint of capacity on the north-south waterway route (Canal du Nord limited to 650 t) limits the water transport share on the existing route to just over 3 per cent.

66. The demand is expected to grow in line with EU projections. The Seine-Nord Europe Canal is expected to have three main consequences on transport demand. It represents an offer of transport services that is likely to attract biofuel production units or

multiproduct biodistilleries to the regions crossed by the canal (Picardy, Nord-Pas de Calais); these will generate significant flows of cereal supplies, but also flows of agricultural co-products and energy products leaving the plants. It offers a highly competitive logistics solution for supplying Picardy and Île-de-France with construction materials from quarries in northern France and Belgium, it will redirect flows of materials that without the Seine-Nord Europe Canal would come from other regions less well served by concentrated volume modes, thus causing an increase in road traffic. It will stimulate the location of new regional, national or European distribution centers in Nord-Pas de Calais, Picardy or in the Seine valley, where the transport networks and the accessibility from all the seaports will have been significantly improved; this will result in new flows of containers imported from overseas and return flows of empty containers which will also be more substantial than in the situation without the project. As a consequence of all factors considered, the traffic in the central "reference" section of the future canal at Péronnes is projected at 13.8 Mt in 2020 and 16.3 Mt in 2050, compared to a volume stagnating at 5 Mt with the existing smaller canals, on account of their saturation, and regardless of how much demand increases.

G. Coastal routes and connected inland waterways

67. Infrastructure here relates to the ship canals incorporated in these routes (E 60 – Nord-Ostsee Kanal and E 90 – Corinth Canal), but above all to the port facilities enabling development of river-sea traffic or coastal shipping, notably under the "Motorways of the Sea" project promoted by the EU. This also covers the isolated inland waterways which are interconnected by these maritime routes: Guadalquivir estuary (E 60–2), UK waterways open to sea vessels (E 60–1 and E 60–3), Douro (E 60–04), Göta (E 60–07), Finnish waterways (E 60–11) and the Po in Italy (E 91).

1. Infrastructure

68. There are by definition no system-wide investments on these routes. It is nevertheless of significance that investments are continuing or are being planned in order to increase the efficiency or the potential economic benefits of these combined river-sea routes. Some investments appear to concern only maritime traffic, but in reality may serve shipping throughout the AGN river-sea network. For example, the German Government's investment of more than € 400 million on the Kiel Canal (eliminating a 20 km bottleneck and building a third lock chamber at Brunsbüttel) will cut transport times and lower transport costs, primarily benefiting the German seaports with their substantial share of Baltic Sea trade, but also benefiting all river-sea operations from the North Sea through the Baltic Sea and into Finland and the Russian Federation. Other infrastructure investments of note are the new lock for access to the port of Sevilla, opened in October 2009 (route E 60–2, although this is more for maritime access than river-sea traffic) and projected improvements on the Saimaa Canal in Finland (lengthening the operating season) and the Bistroe Channel of the Danube (for flows to and from Ukraine).

69. The status quo applies in the United Kingdom of Great Britain and Northern Ireland (e.g. ports of Goole on the Ouse, Manchester on the Manchester Ship Canal), on the Göta in Sweden (no enlargement now planned at Trollhättan) and in Italy (no progress on the Padua-Venice Canal).

2. Fleet

70. The technical innovation of "box-shaped" short-sea mini-bulkers enables river-sea transport to compete with roll-on/roll-off and container ships by avoiding the break of bulk

at coastal seaports, according to a report published in 2002.[27] This has important regional consequences in hitherto land-locked or isolated areas with navigable rivers and canals. Door-to-door journeys by river-sea transport have potential for future growth, but the trend is hindered by the higher investment and operating costs of such vessels.

71. For the same reason, there has been very limited development under the EU "Motorways of the Sea" project, which was found by recent studies to be uneconomic. Why put the trailers on to Ro-Ro vessels for long transits, with the immobilization time that implies, and the risks involved (ferries with their folding doors are intrinsically vulnerable), where 45–feet pallet-wide containers on regular maritime container lines could provide the equivalent transport service more efficiently and cheaply?

3. IWT Performance

72. The transport demand and supply throughout the maritime routes in Europe is beyond the scope of this report. The issue is to move towards combined investments – countries' investments in port and waterway infrastructure, and shipowners' investments in new vessels adapted to the changing demand – which will accelerate the trends observable today, and encourage investments in modern vessels optimizing the service to meet new demand sectors in particular (cf. pallet-wide containers as mentioned above).

73. Small coasters (up to 2000 or 3000 dwt) will continue to have a role to play in many river-sea services between points on the AGN network, and they would also benefit from certain investments (Saimaa Canal, dredging the entrance to the Douro, etc).

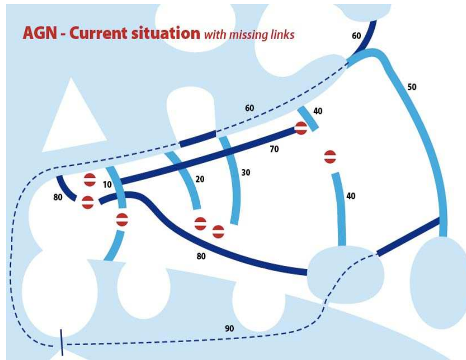
IV. Conclusions: Policy trends and challenges ahead

74. What is particularly important to note in 2010 is the much more widespread awareness of the advantages of IWT, which are now also selling points to governments planning and building improved or new infrastructure. It is clear today that this heightened awareness is levering changes in investment decisions at the pan-European level, and this in turn is raising confidence among operators who are themselves investing at a higher rate than in the 1980s and 1990s. The clear trend is towards a consolidated share of the market for IWT throughout the main networks in sections A and B of Chapter III. The smaller, less integrated networks, presented in sections C-F of Chapter III, offer infrastructure of adequate quality which may be expected to serve a greater role, wherever there is essential demand for economical transport of large volumes of bulk goods or liquids, or where conditions justify a waterborne leg in combined transport operations. Accordingly, it may be observed that the efficient response of the profession to new transport demand has succeeded in breaking down the barriers which for long prevented the industry from working to its full potential and, in particular, the barrier of non-existent or incomplete infrastructure.

75. This drawback of the non-existent or incomplete infrastructure relates not to the IWT mode itself, nor to its competitive position, but to the impossibility of serving many AGN routes. Missing links make up nearly 1500 km, or 5.3 per cent of the E waterway network of 27 900 km. The percentage is small, but the impact of the interruptions significantly weakens the network as a whole. The following diagram, which focuses on the main routes only, shows clearly the non-integration of the network in the current situation.

[27] Jean-Pierre Rissoan, « River-sea navigation in Europe », Laboratoire d'Economie des Transports à l'Université Lumière Lyon 2, 2002.

Figure 1
Missing links in the AGN network



76. The answer to this drawback lies in phased completion of the infrastructure**.** The impending start to works on the Seine-Nord Europe Canal, with locks up to 30m deep, proves that building canals across watersheds is feasible. It also shows that the results of comprehensive cost-benefit analysis of such projects have changed in the last 10–15 years. The threshold of acceptable infrastructure costs in relation to projected benefits, taking fully into consideration all the factors as appreciated under current criteria (in 2010), is being pushed higher. If this trend continues, then other more ambitious and more costly watershed connections may be expected to become economically feasible.

77. The EU has the advantage of considerable pooled resources devoted to Europe-wide evaluations and policy definition. The results of analyses conducted for the 27 member States may be considered relevant for the entire AGN waterway network. In 2005 three-quarters of traffic flows in the EU were via roads, compared with half in 1970. Forecasts indicated that there would continue to be sustained growth in freight transport in the EU. In 2001, in its White Paper on transport policy, the Commission predicted an increase of 38 per cent in exchanges of goods by 2010, leading to an increase of 50 per cent in HGV traffic if no remedial measures were applied. This growth would have notable effects on the environment: the external costs generated by this sector (pollution, energy consumption, congestion of main roads, etc) represent 8 per cent of Europe's GDP.

78. In reality, some remedial measures were taken, and have already resulted in a small but significant transfer of freight from road to IWT (while transfer from rail is marginal).

79. The policy, embodied in the measures taken by national governments in the transport sector, has produced in the first place a significant change in the image of IWT, which is taken into account as essential component of future transport supply, instead of being condemned to a marginal position, in a political and electoral "backwater".

80. Of course, growth has been fuelled in part by ongoing investments in the infrastructure, giving operators the confidence to invest in carrying capacity. This is typically the case in Germany, where east-west exchanges through the enlarged Mittelland Canal have increased significantly.

81. But growth is also remarkable on the isolated high-capacity waterways in France. This reveals that a new dynamic has been created in advance of major new investments, and in advance of completion of the European inland waterway network. The new dynamic is fuelled by several complementary phenomena:

(a) Additional credibility given to the industry by the fact that new investments such as the Seine-Scheldt network are being prepared;

(b) Industry given extra motivation to seek and adopt IWT solutions through the "win-win" arguments of lower costs and eco-responsibility;

(c) The phenomenal growth in container movements by inland waterway, 30 years after the first such movements on the Rhine, gives IWT a "modern" image which it could hardly cultivate when major flows were coal to fuel thermal power plants;

(d) The water transport industry is assisted in logistics and in its communications with shippers and freight forwarders by modern technology;

(e) Waterway authorities have started energetically to promote the water transport industry, i.e. the major use of the infrastructure which they build, maintain and operate, as part of their mission in the public interest;

(f) As part of this new outreach, the waterway authorities are also promoting the professions of the water transport industry, particularly, that of barge skipper, to ensure that fleet capacity is maintained and increased in line with demand.

82. As a result, the IWT component of overall transport supply is now in the mainstream of transport policy definition and decisions, and this is a relatively new situation, which is likely to be confirmed in the coming years.