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Development dilemmas of water transport of Mazovia

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ABSTRACT

The Polish government conducts program works on the development of the E40 waterway along the Vistula and the Bug in accordance with *the European Agreement on the main inland waterways of international importance* (*AGN*). In light of the current investment practice, there is still a long way to go for the implementation of the E40 waterway in Mazovia, while the current findings of these programs and related study plans are at many points controversial.

In this situation, this article aims to identify the weaknesses of these findings, indicate other ways to solve the already embarrassing decision-making situations (dilemmas), analyze and evaluate basic decision-making alternatives, and choose optimal solutions for Mazovia.

The author has identified the following basic decision dilemmas: (0) Does a waterway network in Mazovia exist or not? (1) Whether to build this network or not? (2) Whether to reject the *AGN Agreement* or not? (3) Whether to build a network in full or limited spatial extent? (4) Whether to build following AGN or lower waterwaytechnical classes? (5) Whether to build against ecologists or in harmony with them?

As a result of detailed analyzes and assessments, the author chose to solve these dilemmas, assuming (0) the lack of the waterway network in its current state, (1) undertaking the investment program for the construction of this network as satisfying the potential undisclosed demand in the field of water transport, (2) not rejecting the *AGN Agreement* as consistent with the long-term EU transport policy, (3) building the waterway network in the full spatial scope, (4) constructing a complete network in one step, i.e. at least Vb (2,80 m) class, as well as (5) creatingthis waterway network in agreement with ecologists.

When adopting such design assumptions, a positive plan is outlined, which would involve, first of all, resigning from the existing plans to build the Vistula, Narew and Bug cascades as leading to the obtaining the waterways of undervalued classes IV and Va and to the right protests of ecologists, and secondly replacing the cascade with the construction of side shipping canalsof Vb (2,80 m) class or higher located within the broad valleys of the Vistula and the Narew but outside the most valuable natural areas of these valleys. In relation to the Bug waterway, the author prefers the course of the canal beyond the river valley through Wilga and Garwolin.

Key words: water transport, inland waterways, shipping channels, optimization of the location of transport investments, feasibility studies, hydrology, environmental protection, AGN

Introduction

A significant part of the country's waterway network (SDW) is located within the borders of the Masovian Voivodeship. This includes a long section of the Vistula waterway (DWW), which quality is, however, very low. According to *the Ordinance on the inland waterways* [Rozporządzenie Rady Ministrów z dnia 26 czerwca 2019 r.], this waterway covers the section of the Vistula from the mouth of the Przemsza River to the mouth of the Gulf of Gdańsk togeth-

er with Włocławskie Lake. According to *the Ordinance on the classification of inland waterways* [Rozporządzenie Rady Ministrów z dnia 7 maja 2002 r.], the Mazovian section of the Vistula holds class Ib, except for Włocławskie Lake, where this class is Va.

The official register of Mazovian waterways [Rozporządzenie Rady Ministrów z dnia 26 czerwca 2019 r.] also includes the Bug River Waterway (DWB) from the mouth of the Muchawiec River (in Brześć, Belarus) to the mouth of the Narew River; the Narew Waterway from the mouth of the Biebrza River to the mouth of the Vistula River together with The Zegrze Reservoir (DWN) and the Żerański Canal, which connects this lake with the Vistula River in Warsaw. The Bug and the Narew are waterways of even lower quality than the Vistula (free-flowing). It is due to them being classified as class Ia under the above-mentioned Ordinance [Rozporządzenie Rady Ministrów z dnia 7 maja 2002 r.], and only The Zegrze Reservoir and the Żerański Canal have higher class II.

A high-quality waterway should be at least class IV. This means that the only well-developed waterway in Mazovia covers only a short section of the Vistula within Włocławskie Lake (about 25 km). The remaining waterways do not meet the requirements of modern water transport, so they require modernisation or construction from scratch.

Poland has acceded to *the European Agreement on the main inland waterways of international importance (AGN)* [Europejskie porozumienie… 1996] and thus, pursuant to Article 1 thereof, has committed to developing the defined sections of waterways of international (European) importance within the framework of their relevant programmes. According to Annex I to the Agreement, sections of the European waterway E40, located along the Vistula and the Bug (from Gdańsk to Brześć) run through Mazowsze. This Annex states that these sections '*are included in the relevant infrastructure development programmes*'.

Such programmes have already been designed. For the time being, they do not specify the exact location of SDW based on the Decision on Environmental Conditions (DŚU) or the detail level of implementation (i.e. as construction projects do). Therefore, the international community cannot expect the Polish government to implement them soon.

Nevertheless, at the study level, the work is almost finished. In 2016, the Ministry of Maritime Economy and Inland Navigation, responsible for the development of the inland waterway network according to AGN, prepared *Expertise on the development of inland waterways in Poland for 2016–2020 with a perspective to 2030* [Ekspertyza… 2016], which subsequently became the basis for the formulation of '*Assumptions to the plans for the development of inland waterways in Poland for 2016–2020 with perspective to 2030*', adopted by the Resolution No. 79 of the Council of Ministers of 14 June 2016 [Założenia do… 2016]. These *Assumptions* will be specified after the completion of the '*Feasibility Study for the Development of International Waterways E40 for the Vistula River from Gdańsk to Warsaw, E40 from Warsaw to the Poland–Belarus border (Brześć) and E70 on the section from the Vistula River to the Vistula Lagoon (Elbląg)*', which is currently underway [Studium wykonalności…]. This study will determine the course of the E40 route in Mazovia. Therefore, it will be the basis for submitting the application for issuing DŚU and for developing a construction plan for the whole investment or its subsequent sections.

In light of the investment practice to date, there is still a long way to go for implementation of the above-described plan for the development of inland waterways in Poland (PRŚDW). The provisions of this plan are already controversial at many points. There is a concern that these arrangements are not correct, which may delay or even block the entire SDW development programme.

In this context, this study aims to identify weaknesses in the arrangements of PRŚDW, to indicate other ways of solving the already identified problematic situations (dilemmas), to analyse and evaluate basic decision-making alternatives and to select optimal solutions for the key area of Mazovia.

Dilemma 0: Does SDW exist or not?

According to the above-mentioned *the Regulations* [Rozporządzenie Rady Ministrów z dnia 26 czerwca 2019 r.; Rozporządzenie Rady Ministrów z dnia 7 maja 2002 r.], PRŚDW assumes that the Mazovian SDW described above may exist. At the same time, the following statements undermine this hypothesis, including the key statement in *the Assumptions* [Założenia do… 2016, p. 4]: "(…) the actual navigation conditions of [regional waterways] in most cases do not correspond to the parameters assigned to them at the time of their classification." For example – the Bug waterway (DWB) was classified as class Ia, and at the same time it turns out that the actual conditions do not meet this class requirements, which means that DWB is an 'out-of-class' waterway (because class Ia is the lowest possible class). Therefore, it can be argued that SDW within Mazovia does not exist as such. This statement applies to free-flowing rivers, formally recognised as waterways. The sections of these rivers connected by canals 'hold' the class assigned to them, but do not form a network (Włocławskie Lake and Zegrzyńskie Reservoir with the Żerański Canal).

Confirmation of this radical diagnosis can be found in extensive analyses included in *the Study* [Studium wykonalności…]. The long lists of possible variants of the E40 waterway development (Stage 1 of *the Study*) include the simplest solutions. They assume a regulation of the Vistula and the Bug rivers (longitudinal and transverse dams and spurs), stating that this method will allow achieving class II at most for the section of the Vistula between Płock and Warsaw, while the remaining sections in Mazoviawill not achieve any class at all. Therefore, since the lower Bug River and the central Vistula River are supposed to remain out-of-class waterways after regulation, it means that currently, they are also out-of-class.

If the Mazovian SDW really holds the classes indicated in *the Regulation* [Rozporządzenie Rady Ministrów z dnia 7 maja 2002 r.], it should be used by barges (at least periodically). Meanwhile, the Central Statistical Office does not publish data on water transport in the Mazovian Voivodeship [Rocznik Statystyczny... 2018]. This means that this transport is insignificant in tonnage or does not exist at all. The author's observations indicate that in Mazovia there is practically no water transport on a regular network scale (there are only local

irregular transports, mainly for tourists in Warsaw and Włocławskie Lake and Zegrzyńskie Reservoir).

Thus, it is not surprising that *the AGN Agreement* [Europejskie porozumienie… 1996] states in Annex I that sections of the European waterway E40 running along the Vistula and the Bug rivers '*do not exist at present*'. In light of the above, the resolution of the above-mentioned dilemma should be negative, i.e. it should be assumed according to *AGN* that **there is no SDW in Mazovia**. Although this dilemma, as referring to the existing state, does not concern but directly affects the current development plans (cf. dilemma 4).

Dilemma 1: Whether or not to build SDW?

Transport investments only make sense if they respond to the relevant transport needs. Since waterway transport in Mazovia has been practically non-existent for many decades, it may be proof of the lack of needs for the Mazovian inland navigation. Or, in other words, such needs can be fulfilled by other branches of transport, which it is currently the case, and such a situation may persist in the future. This would lead to the conclusion that there is no need to create SDW.

On the other hand, studies and forecasts of inland waterway transport indicate that demand for such transport exists but cannot be met due to poor navigation conditions. For example, the latest forecast of Prof. K. Wojewódzka-Król and Prof. Ryszard Rolbiecki estimates the potential demand for transport on the lower Vistula in the long term for around 12 million tons of cargo after the creation of a real waterway there, cf. *the Expertise* [Ekspertyza… 2016, p. 66]. The Study [Studium wykonalności…] confirms the existence of the latent demand. Under its tasks I.1 and I.2, numerous companies have been identified along the E40 that could potentially use the waterway transport. It should be anticipated that after the construction of the E40, these companies will be joined by others, directed at taking advantage of the new waterway.

Another benefit of the construction of SDW within and around Mazovia is the position of the European Union, which supports the development of water transport. Its strategic documents assume, among other things, "transferring by 2030 30% of road transport over 300 km to other means of transport, i.e. rail or water transport, and by 2050 – over 50% of road transport of goods". Additionally, "it is also recommended that the core network corridors of TEN-T should have the infrastructure for three transport branches, i.e. rail, road and inland waterway transport", cf. *the Assumptions* [Założenia do… 2016, p. 5]. The planned SDW in Mazovia is a part of the North Sea-Baltic Sea TEN-T corridor, which is currently dominated by roads and railway lines. Therefore, it follows the above-mentioned EU recommendations.

Thus, in the author's opinion, the aforementioned dilemma should be perceived as positively resolved, i.e. in accordance with the EU transport policy, **the construction of SDW in the Mazovian region is justified**.

Dilemma 2: Whether to revoke AGN or not?

The dilemma 1 is related to the issue of a radical change in the Polish government's transport policy resulting, in particular, from the adoption of *AGN* and the currently strong political will to implement this *Agreement*. Since *AGN* has caused this change, it might have been better to reject it and to stay with the old policy. The termination of *AGN* is not very difficult as, under Article 15 of this *Agreement*, written notification to the UN Secretary-General is sufficient. The termination takes effect one year after the date of receipt of such notification by the UN.

Evidence of the government's rapid change in transport policy with regard to SDW can be found in the previously adopted strategic and spatial plans. Thus, in the *National Spatial Planning Concept 2030* [Uchwała RM... 2012] of 2011, only the modernization of the Odra River Waterway (E30) was planned. The waterways in the Vistula river basin (including E40) until 2030 were supposed to be left as they were. A similar arrangement is included in the *Mazovian Voivodeship Spatial Development Plan* (PZPWM) [Rozporządzenie Rady Ministrów z dnia 26 czerwca 2019 r.] in the 2014 version. *The Transport Development Strategy to 2020 (with perspective to 2030)* (SRT) [Strategia rozwoju transportu… 2013] from 2013 also repeats the above development arrangements. However, it mentions (on page 56) "the beginning [to 2020] of the Lower Vistula River development (urgent due to the threat to the safety of the water level in Włocławek)."

Only the *Strategy for Sustainable Development to 2020 (with perspective to 2030)* (SOR) [Strategia na rzecz… 2017] of 2017 mentions the construction of the Mazovian SDW by defining the following course of action until 2030 (p. 314): "reconstruction of the transport capacity of waterways (parameters of the IV navigability class) – on selected, economically and ecologically justified sections". SRT was adapted to this *Strategy* by developing in 2019 its new version under the changed name: *Strategy for sustainable transport development until 2030* [Strategia zrównoważonego… 2019]. A similar process took place in relation to *PZPWM* [Rozporządzenie Rady Ministrów z dnia 26 czerwca 2019 r.] after its change in 2018. According to SOR, the E40 route running along the lower Vistula and the Bug River was supposed to be made navigable.

The Polish government has not yet introduced these ambitious plans for SDW development in the Vistula river basin (Fig. 1) into EU strategic documents. In particular, into the arrangements for the Trans-European Transport Network TEN-T (cf. Fig. 2), which may be due to the general, study-like nature of these plans. As a result, the government plans are not consolidated at the European level, and the water transport network TEN-T with appropriate parameters is practically absent in Poland.

On the other hand, the above-mentioned EU policy of giving priority to water transport may support the continuation of the *AGN Agreement* in the long term. It should be expected that, in line with this policy and the plans of the Polish government, SDW in Poland will be adequately developed within the TEN-T network.

In light of the above, the author believes that the above-mentioned dilemma should be resolved negatively, i.e. the **AGN Agreement should not be rejected**, but actions aimed at its implementation should be intensified.

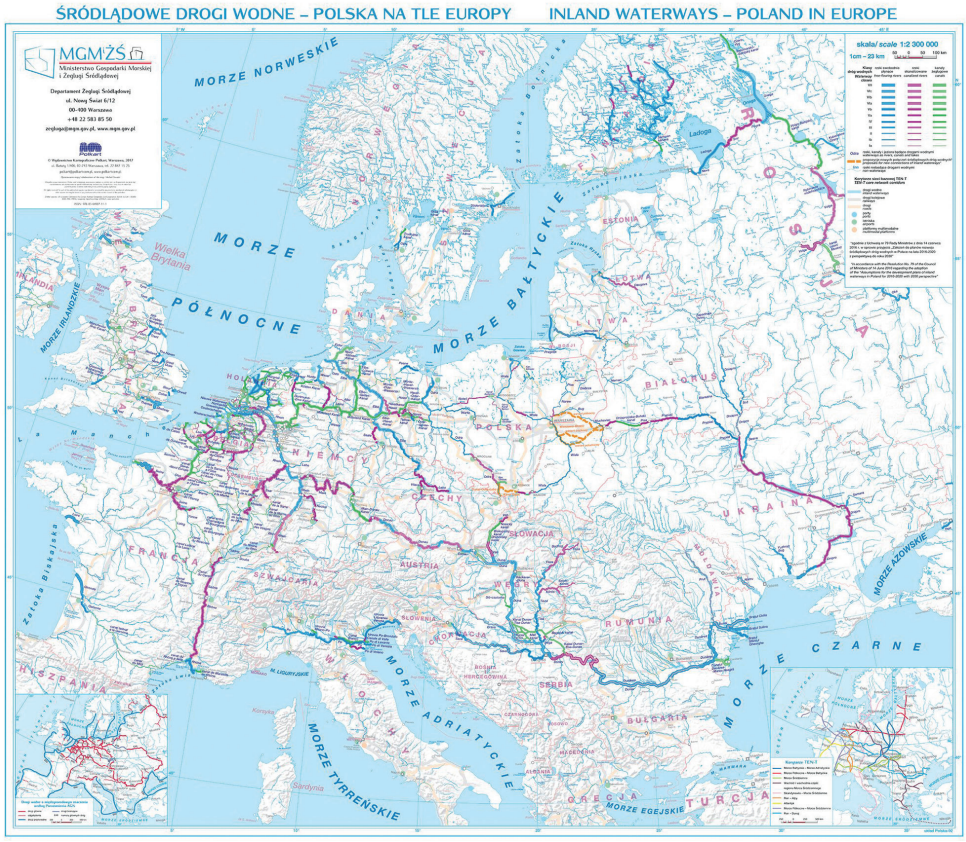

Fig. 1. Current development plans of the Ministry of Maritime Economy and Inland Navigation in terms of inland waterways in Poland in comparison to Europe

Source: Ministry of Maritime Economy and Inland Navigation – www.gov.pl/web/gospodarkamorska/rodladowe-drogi-wodne

Fig. 2. Current TEN-T network in Central Europe for inland waterways and ports

Source: *Regulation* [Rozporządzenie Parlamentu… 2013]

Dilemma 3: Whether to build SDW in full or limited scope?

With regard to the Mazovia region, the *AGN Agreement* applies only to one waterway defined as the E40 road that runs along the Włocławek – Warszawa – Brześć route. If the government is determined to develop the E40, the question arises whether to develop other Mazovian waterways as well or to abandon them permanently.

The Study [Studium wykonalności…] made a plan for the E40 to run along the Vistula up to Dęblin, and then along the Wieprz River to the Kock region and then through the canal to Brześć (the variant of the route preferred by the investor). Therefore, the following waterways of Mazovia would not be included in the course of the E40:

- a section of the central Vistula from Dęblin to the mouth of Kamienna River (Lipsko County);
- Żerański Canal;
- the waterway of the Narew River in its entirety, i.e. from the mouth of the Vistula to the mouth of the Biebrza River (DWN);
- the entire waterway of the Bug River, i.e. from the mouth of the Narew River (Zegrzyńskie Reservoir) to Brześć (DWB).

The old government plans intended to build the entire DWW from Gdańsk to Cracow and further on through the Silesian Canal to connect with the Oder River. Although the section Dęblin – Kraków – Odra is not included in the European road network covered by *the AGN*, its construction is of great economic importance for Poland. Therefore, it should be included in the planned Masovian SDW.

When it comes to the Bug River, the government plans (e.g. in the above-mentioned *Study*) rightly propose a permanent abandonment of DWB, arguing that the construction of the Dęblin – Kock – Brześć Canal (the Polesie Canal) makes the construction of a second waterway in the same direction towards the border with Belarus unnecessary (economically and functionally).

As far as the Narew is concerned, the government plans do not cover the construction of DWN (cf. Fig. 1). This is presumably due to the high cost and priority of plans for the development of the E40 and DWW to Krakow. However, the creation of such a waterway may be considered in the future. This is because the beginning of this road is already created in the form of Zegrzyńskie Reservoir and the Żerański Canal. The second reason would be the previously mentioned EU principle of creating a triple transport bundle in a given transport corridor. Referring to the so-called *Via Baltica*, it results in the construction of a waterway from Warsaw via Kaunas to Klaipeda (the Kaunas – Klaipeda section already exists as E41).

It should be estimated that the decision on the course of E40 through Dęblin is basically correct (because it shortens the total length of DWW+DWB). As far as the other waterways of Mazovia are concerned, the author **supports the development of DWW and DWN and the resignation from the development of DWB** due to its replacement by the Polesie Canal.

Dilemma 4: Whether to build according to the AGN or lower the technical parameters?

The AGN Agreement [Europejskie porozumienie... 1996] provides detailed guidelines for minimum classes of European waterways. Thus, part a of Annex III to *the AGN* defines the general principles:

> (II) Only waterways meeting the basic requirements of class IV (…) can be considered as waterways of significance E (…).

(III) When upgrading a class IV waterway (as well as smaller regional waterways), it is recommended that at least the parameters of class Va are met.

(IV) New waterways of significance E should at least meet the requirements of Class Vb; in this respect, a draught of 2.80 m should be guaranteed.

Taking into account the resolution of Dilemma 0, if it is assumed that there is no SDW in Mazovia, then rule IV, concerning new waterways, will apply to the creation of this network. This means that in the design plans for all investments concerning the Mazovian SDW at least class Vb and the largest guaranteed draught of 2.80 m should be assumed.

Another dilemma arises here, as the government's PRŚDW mentions obtaining a minimum class IV for important waterways in Poland as the main objective of this plan (*the Assumptions* [Założenia do… 2016], p. 6). The issue of design classes for the future SDW has been developed *in the Study* [Studium wykonalności…]. It states that the preferred Vistula canal system (large cascade) will lead to a waterway of at most class IV in the Warsaw – Dęblin section or class IV or class Va in the Włocławek – Warszawa section. For the Poleski Canal class Vb was adopted. The official design assumptions adopted for the Mazovian DWW are inconsistent with *the AGN Agreement*. The reason for this is the creation of the cascade as a way of building DWW.

In light of the above, in the author's opinion, the resolution of the above-mentioned dilemma should be positive, i.e. **SDW should be developed according to AGN**. This means that the plans and studies to date are inconsistent with this solution and require significant adjustments. The aim of which should be to guarantee a minimum class Vb (2.80 m) for the entire Mazovian SDW. The Vistula Cascade (and probably the Narew) does not contribute to this goal.

Dilemma 5: Whether to build against or in agreement with the ecologists?

As a result of the development of nature protection and the introduction of protection of valuable nature areas into the Polish law, the Vistula, Bug and Narew valleys and many smaller rivers of Mazoviawere located within legally protected areas established under the Act on Nature Conservation [Ustawa z dnia 16 kwietnia 2004 r.]. The Natura 2000 network areas are the result of Poland's accession to the EU. Therefore, there is a significant contradiction between investing in SDW and natural protection of these valleys.

This contradiction is already turning into a conflict between SDW designers and ecologists. Despite the preliminary and general nature of these projects so far. For example, the National Society for the Protection of Birds [OTOP] (protected areas in river valleys are intended, among other things, to protect birds) submitted many comments during the public consultation of PRŚDW. Among OTOP's comments there was, for example, the following key point: "The construction of the first element of the Vistula Cascade, i.e. the water level in Siarzewo, would cause destruction (permanent flooding) of the Natura 2000 area – the Włocławek Vistula Valley and partial destruction of two other areas – the Nieszawa Vistula

Valley and the Lower Vistula Valley. (…) The full implementation of the Program would result in the loss or degradation of several Natura 2000 areas." OTOP closes its comments with a conclusion: "we request that the implementation of the Vistula River Waterway Development Programme be stopped" (Table of comments… [Tabela uwag… 2019], notes 11 and 12). This means that the design assumption made in PRŚDW for the construction of the Vistula Cascade and using the other rivers as a means ofcreating the complete SDW is incompatible with the protection of valuable natural areas located in the valleys of these rivers.

The ecologists must be acknowledged in this dispute because all ecological law is behind them (resulting in a large extent from EU directives). In particular, the key art. 33 of the Act on Nature Conservation [Ustawa z dnia 16 kwietnia 2004 r.], which prohibits taking actions that may "significantly negatively affect the conservation of the Natura 2000 area." Undoubtedly, the construction of the Vistula Cascade will result in permanent flooding of a significant part of the river inter-embankment zone, where the whole or a significant part of the Natura 2000 area is located. This will have significant impacts on the area, so its construction is only possible "in the absence of alternative solutions" (Article 34).

Alternative solutions, such as a construction of a waterway outside Natura 2000 areas, are possible to be found, which was proved by the authors of PRŚDW themselves. They resigned from the construction of DWB and developed an alternative plan for the construction of a shipping canal along this river (Fig. 3), but outside of its natural valuable areas. It was also adopted in principle as an optimal solution for the Polesie Canal located even further from the Bug River (Fig. 4).

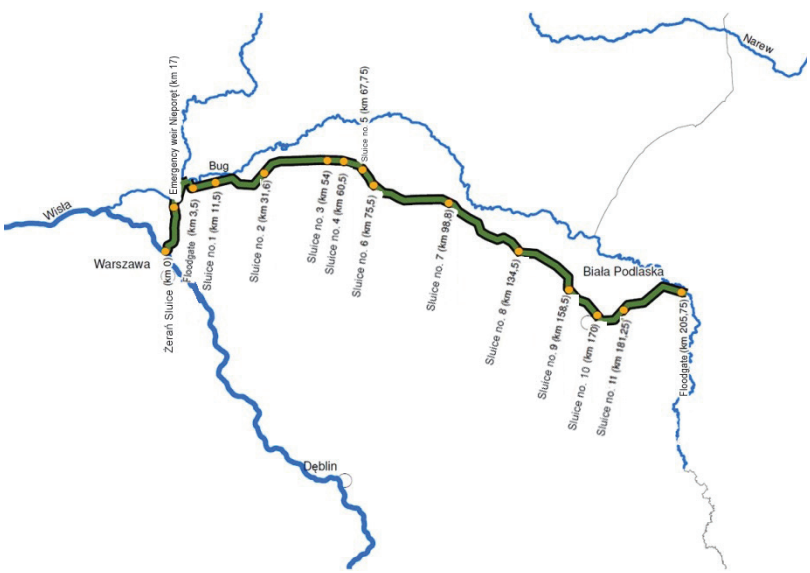

Fig. 3. Concept of building a side canal of the Bug River

Source: *Study* [Studium wykonalności...], stage 1, Fig. 46

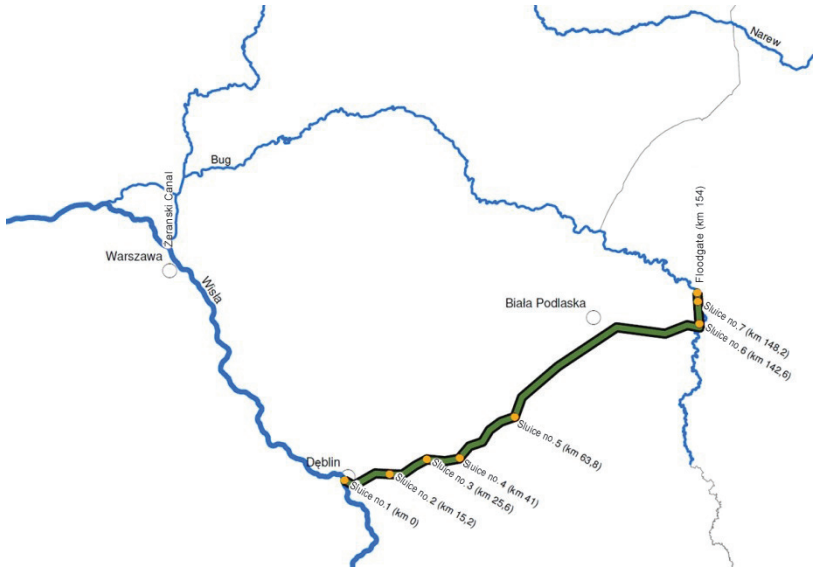

Fig. 4. The adopted concept of building the Polesie Canal (Dęblin – Kock – Brześć)

Source: *Study* [Studium wykonalności...], stage 1, Fig. 48

It is a shame that the authors of PRŚDW were not consistent in their ecological assumptions. If they assumed the protection of the Bug valley as the main factor determining the location of DWB, they should have acted the same way with regard to the protection of other river valleys. This applies primarily to the protection of the Vistula valley in the section Płock – Dęblin, at the bottom of which there are numerous Natura 2000 areas and nature reserves, and the Wieprz Valley, where the 'Lower Wieprz' Natura 2000 habitat area is located. This also means that alternative waterway locations, bypassing the above-mentioned valuable nature areas, should be developed. The Bug example shows that there are no location obstacles for hydraulic engineers and that locating the waterway outside the valleys is technically possible.

To sum up, the author is in favour of **constructing SDW in agreement with ecological law**. Regarding Mazovia, this means that the **concept of building the Vistula Cascade is impossible** under this law (this also applies to the possible cascades of the Narew, the Bug and the Lower Wieprz rivers). Moreover, the previous **SDW location studies need to be expanded with alternative waterway routes bypassing valuable nature areas**, especially Natura 2000 areas.

Positive plan

The major conflict between the accepted location of the Polesie Canal (Fig. 4) and the Natura 2000 area 'Dolny Wieprz' (Lower Wieprz) results in the need to return to the rejected

concept of the canal's route through the Żelechowska Upland and Garwolin (Fig. 5). With such a location there will be no collision between the investment and the protected area. Unfortunately, we still face a collision with the bird area Natura 2000 'Tyśmienica Valley'. However, it is much less significant than in the previously assumed location variant and can be avoided by locally changing the course of the canal (towards Radzyń Podlaski).

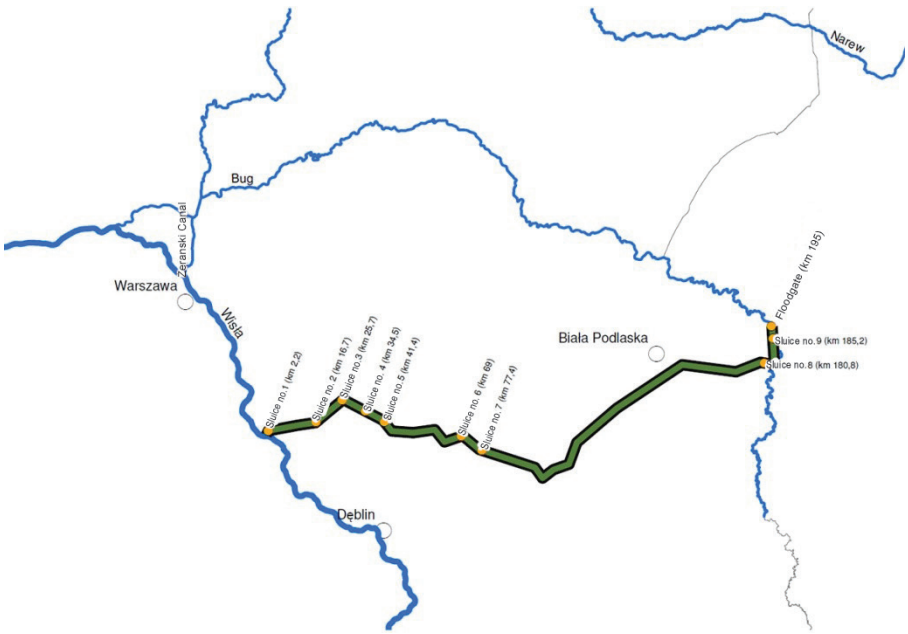

Fig. 5. The environmentally optimal concept of building the Polesie Canal (Wilga – Garwolin – Radzyń Podlaski – Brześć)

Source: *Study* [Studium wykonalności…], stage 1, Fig. 47

As far as the Vistula is concerned, the concept of creating cascades on the river should be abandoned and alternative locations for the construction of the Vistula side-canal should be developed (at least class Vb/2.80 m). These should be located outside the Natura 2000 areas and then they should be ecologically assessed for their feasibility (based on detailed nature inventories). To ensure sufficient water quantity for shipping (and other) purposes, the construction of retention tanks (and possibly dry polders), also located outside the Natura 2000 areas (i.e. basically outside the river embankment), should be included in the side-canalconcept.

The section of the Vistula River above Puławy does not present the possibility of developing a conflict-free natural variant due to the high ridges of the valley (especially near Kazimierz Dolny). By limiting the location options to the bottom of the valley, the variant of routing the canal on the right (Lublin) side of the river seems to be more ecological. The canal should be routed outside of the inter-embankment on the section from Kamień to the Chodelka mouth (near Zastów Polanowski) and within the inter-embankment of the Kazi-

mierz section and above Kamień, on the right or left side of the valley. This does not mean that the symmetrical variant of the canal's route on the left (Mazovian) side of the river or mixed variants must be abandoned. The number of variants and options should be increased each time the current variants of the course of the canal and the reservoirs are ecologically excluded. Such an iterative process should be carried out until several ecologically acceptable variants are found.

This section of the Vistula between Puławy and Karczew can have, due to the wide bottom of the valley, the canal located outside the protected inter-embankment of the river for the most of its length. The side-canal can be positioned on the left or right side of the river (as well as mixed variants). Due to the spatial arrangement of the Natura 2000 areas, the most optimal one seems to be the right-hand variant. It is possible to design it in such a way that it won't collide with the nature-protected areas (although probably connected at local points). Its main advantage would be that it connects easily with the Polesie Canal in the Wilga – Garwolin – Brześć version.

For the Karczew – Warsaw section,due to the dense housing of the Warsaw agglomeration, it is not possible to develop alternatives for the course of the canal and it must be located within the nature protected inter-embankment. However, with its location set closely adjacent to the right or left dyke, the natural damage is likely to be the lowest, covering an investment strip of about 50–70 m width (5–7% of the inter-embankment width on average); optionally, the location of the canal at the left or right dyke along the entire length or mixed left/right versions at individual subsections may be considered.

The section of the Vistula River between Warsaw and Płock will probably not be able to host a nature-friendly variant since both the river embankment and large areas outside it are protected. The canal location below Warsaw (Tarchomin) can be 'almost' environmentally collision-free, but only for the price of moving it beyond the bottom of the valley (i.e. accepting sluicing and pumping water to the higher levels of the canal). There are two general passages possible here: the left-hand one south of the Kampinos Forest (through Sochaczew – Chodaków) and the right-hand one through the Żerański Canal and Zegrzyńskie Reservoir to Dębe and further through the Płock Upland to Płock. Those variants located at the bottom of the valley would be technically better, and should not be discarded before obtaining a potential ecological exclusion rating. Assuming that this assessment would be roughly related to the length of the collision between the canal and environmentally valuable areas, it seems as environmentally optimal (among many single and mixed left/right-handed variants) to choose a left-handed variant of the canal's course outside the inter-embankment in the section Łomianki – Wyszogród (but north of the Kampinos Forest) and right-handed (but below the high ridge of the valley) in the further section Wyszogród (Drwały) – Płock (Borowiczki).

As far as DWN is concerned, its course within Zegrzyńskie Reservoir (unprotected by nature) seems to be determined. In its upper part, left-handed or right-handed plus mixed variants can be considered. However, the variant of its running outside the Narew floodplain (covered by Natura 2000 protection) on the left from Łomża to Różan (lower parts of Międzyrzecze Łomżyńskie) and on the right from Różan to Pułtusk (below the high ridge of

the Ciechanów Upland, approximately on the line Dzbądz – Rzewnie – Gnojno) seems to be ecologically optimal. This variant does not guarantee complete bypassing of the Natura 2000 areas. Neither would any other localization variant that may be considered, due to the spatial arrangement of these areas, which create a compact large-spatial network.

Conclusions

The above-mentioned analyses concerning the possible construction of complete waterways in Mazovia lead to the following general conclusions:

- Currently, there is no waterway network in the Mazovian Voivodeship. Only short isolated sections (e.g. on Włocławskie Lake and Zegrzyńskie Reservoir) meet the technical parameters required for any class of waterway, and the remaining sections are out-of-class roads, unsuitable for regular mass cargo transportation with barges.
- The construction of a network of fully developed waterways in the Mazovian region is justified. Studies indicate that there is a demand for inland waterway transport, which is currently blocked due to the poor condition of these roads. In addition, Poland is obliged to invest in waterway transport under documents at EU and UN level, in particular the adopted European transport policy and *the AGN Agreement*.
- *AGN* should not be revoked, but instead, efforts to implement this agreement should be intensified. Water transport should be given long-term investment priority in line with the EU policy.
- According to *AGN*, waterways of at least Vb class (2.80 m) should be created in Mazovia; a gradual approach towards this technical class should not be assumed, as the transformation of a waterway into a higher class is not economically viable; this means that the existing plans to build the Vistula, Bug or Narew cascade should be abandoned, as these plans would only lead to the creation of a waterway of class IV or Va.
- Previously planned cascades along the main Mazovian rivers are now in conflict with Polish and European environmental law. This is because there are valuable natural areas in between the embankments of these rivers, especially Natura 2000 areas, which would be significantly damaged by permanent flooding; the solution to this ecological dilemma would be the construction of side navigation canals of at least class Vb (2.80 m) within the wide valleys of these rivers but outside the most valuable natural sections; such a location solution has emerged for the Lower Bug valley; it would be sufficient to apply it consistently also to the Mazovian parts of the Vistula and the Narew.

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Dylematy rozwoju transportu wodnego Mazowsza

STRESZCZENIE

Polski rząd prowadzi prace programowe dotyczące rozwoju drogi wodnej E40 wzdłuż Wisły i Bugu, których celem jest budowa tej drogi wodnej zgodnie z przyjętym przez Polskę *Europejskim porozumieniem ws. głównych śródlądowych dróg wodnych o znaczeniu międzynarodowym (AGN)*. W świetle dotychczasowej praktyki inwestycyjnej, do realizacji drogi E40 na Mazowszu jest zatem jeszcze daleka droga, a tymczasem dotychczasowe ustalenia tych programów oraz powiązanych z nimi planów studialnych są w wielu punktach kontrowersyjne.

W tej sytuacji niniejszy artykuł ma na celu identyfikację słabych stron tych ustaleń, wskazanie innych sposobów rozwiązania ujawnionych już kłopotliwych sytuacji decyzyjnych (dylematów), analizę i ocenę podstawowych alternatyw decyzyjnych oraz wybór rozwiązań optymalnych w odniesieniu do kluczowego obszaru Mazowsza.

Autor zidentyfikował następujące podstawowe dylematy decyzyjne: (0) Istnieje czy nie istnieje sieć dróg wodnych na Mazowszu? (1) Budować czy nie budować tę sieć? (2) Odrzucić *Porozumienie AGN* czy nie odrzucać? (3) Budować sieć w pełnym czy ograniczonym zakresie przestrzennym? (4) Budować zgodnie z AGN czy zaniżyć klasy techniczne dróg? (5) Budować wbrew ekologom czy w zgodzie z nimi?

W wyniku analiz i ocen szczegółowych autor wybrał rozwiązanie tych dylematów, zakładające (0) brak sieci dróg wodnych w stanie istniejącym, (1) podjęcie programu inwestycyjnego budowy tej sieci jako zaspokajającego potencjalny nieujawniony popyt w zakresie transportu wodnego, (2) nieodrzucanie *Porozumienia AGN* jako zgodnego z długofalową polityką transportową UE, (3) budowę sieci dróg docelowo w pełnym zakresie przestrzennym, (4) budowę pełnowartościowej sieci jednoetapowo, tj. od razu na klasę co najmniej Vb (2,80 m), a także (5) budowę tej sieci docelowej w zgodzie z ekologami.

Przy przyjęciu takich założeń projektowych zarysowuje się plan pozytywny, który polegałby po pierwsze na rezygnacji z dotychczasowych planów budowy kaskady Wisły, Narwi i Bugu jako prowadzących do uzyskania drogi wodnej zaniżonych klas IV i Va oraz budzących słuszny sprzeciw ekologów oraz, po drugie, zastąpienie kaskady budową bocznych kanałów żeglugowych klasy Vb (2,80 m) lub wyższej w obrębie szerokich dolin Wisły i Narwi, ale poza najcenniejszymi przyrodniczo obszarami tych dolin. W stosunku do drogi wodnej Bugu autor preferuje przebieg kanału poza doliną tej rzeki przez Wilgę i Garwolin.

Słowa kluczowe: transport wodny, śródlądowe drogi wodne, kanały żeglugowe, optymalizacja lokalizacji inwestycji transportowych, studia wykonalności, hydrologia, ochrona środowiska, AGN

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