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Maritime Access to Congo – State of Affairs *

by

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KEYWORDS. — Congo; Ports; Dredging.

SUMMARY. — On 5 December 1986, our Academy organized a symposium "Maritime Access to Zaire", in which the problems and actions in relation with the accessibility of the maritime ports of Matadi and Boma were presented. Since 1968, the hydraulic laboratories at Borgerhout and Châtelet have provided assistance to the *Régie des Voies Maritimes* (RVM) for improving the management of dredging operations in the *Région Divagante* (wandering area) in the maritime reach of the Congo River. This technical assistance, financed by the Belgian Cooperation, came to a halt in 1988 and the country has experienced since then troubled times which have created difficulties in the running of RVM. Moreover, the mobility of river channels and sandbars has forced RVM to open new fairways. The depths for navigation drop regularly under the acceptable limit and shipping companies complain about that. Today, the issue of maritime access to the Democratic Republic of Congo is raising again with acuteness.

MOTS-CLES. — Congo; Ports; Dragage.

RESUME. — *Accès maritime au Congo – un état des lieux*. — Le 5 décembre 1986, notre Académie organisait un symposium consacré à «L'accès maritime au Zaïre» où furent exposés les problèmes et les actions en relation avec l'accessibilité des ports maritimes de Matadi et de Boma. Les laboratoires hydrauliques de Borgerhout et de Châtelet avaient apporté depuis 1968 une assistance à la Régie des Voies Maritimes (RVM) pour mieux gérer les dragages dans la «Région divagante du Fleuve Congo». Cette assistance technique, financée par la Coopération belge, cessa en 1988 et le pays connut ensuite une période troublée qui conduisit à des difficultés de fonctionnement pour la RVM. De plus, la mobilité des bancs et chenaux a forcé la RVM à ouvrir des nouvelles routes de navigation. Les profondeurs offertes à la navigation baissent régulièrement en dessous des limites acceptables et les armateurs s'en plaignent. Aujourd'hui se pose à nouveau, mais avec plus d'acuité, cette question de l'accès maritime à la République Démocratique du Congo.

TREFWOORDEN. — Congo; Havens; Baggerwerken.

SAMENVATTING. — *Maritieme toegang tot Congo – een stand van zaken.* — Op 5 december 1986 hield onze Academie een symposium „Maritieme Toegang tot Zaire" tijdens hetwelk de problemen en de acties werden uiteengezet in verband met de toegankelijkheid

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van de maritieme havens van Matadi en Boma. De waterbouwkundige laboratoria van Borgerhout en Châtelet verleenden sedert 1968 een bijstand aan de *Régie des Voies Maritimes* (RVM) om de baggerwerken in de *Région Divagante* van de Congostroom beter te beheren. Deze technische bijstand, gefinancierd door de Belgische coöperatie, werd in 1988 onderbroken en het land heeft nadien een sombere periode gekend die verantwoordelijk was voor de moeilijke werking van de RVM. Daarenboven, de beweeglijkheid van geulen en zandbanken in de *Région Divagante* heeft de RVM verplicht om nieuwe vaarroutes te openen. De diepten in de vaargeul dalen regelmatig onder toelaatbare limieten en de reders zijn ontevreden. Vandaag rijst nogmaals, scherper dan voordien, de vraag betreffende de maritieme toegankelijkheid van de Democratische Republiek Congo.

Rationale

On 5 December 1986, the Royal Academy for Overseas Sciences organized a very successful symposium about the maritime access to Congo, called Zaire at that time. In the presentations, various aspects were treated, among which the dredging works needed to ensure a sufficient navigation depth for seagoing vessels sailing to and from the ports of Boma and Matadi. Dredging of the fairway is only required in the *Région Divagante*, the wandering region of the river with very mobile sandbars and shallow crossings (also called sills or riffles) in the navigation route. This area is the transition between the port of Boma and the very deep submarine canyon that penetrates 30 km inland. Further upstream towards Matadi, the river is deep enough, entrenched between rocky banks (fig. 1).

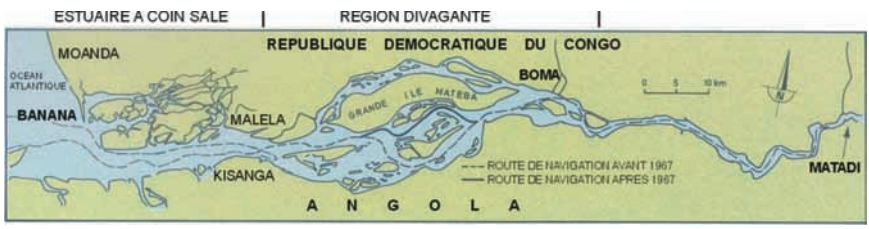

Fig. 1. — The maritime reach of the Congo River, with its very deep submarine canyon, its braided, wandering area (Malela to Boma) and its deep stretch (Boma to Matadi).

From 1968 onwards, a permanent assistance has been given to the *Régie des Voies Maritimes* (RVM) for accompanying the dredging works. This assistance included a study (called 'Mateba') carried out by the hydraulic laboratory of the Ministry of Public Works. After 1978 and the creation of the new regional laboratory in Châtelet, the study has continued in collaboration with the two regional entities of Borgerhout and Châtelet.

The motivation for the Mateba research project was the steady siltation of the southern fairway that was opened in 1924 and named after hydrographer Nisot who conceived it. The navigability of this fairway could be maintained by dredging for more than forty years. Since the mid-fifties, the navigation conditions of the southern route have progressively degraded, so that a new 'Mateba' northern fairway had to be considered. However, hydrographers have always considered this Mateba area as too mobile and unstable, therefore also dangerous for navigation. The project aimed originally at defining with scale modelling the 'best possible' Mateba navigation route. Field data were needed to build and run the model. They were collected during the missions in Congo, in the first two years of the study, in 1968 and 1969. Good historical data existed already, a vast database comprising hydrographical maps (since 1899) and hydraulic and sediment transport data (since 1935).

Analysing the historical and the new field data has clearly shown that scale modelling alone could not provide the answers for improving navigation conditions. This was due not only to model limitations, but also to the unpredictable and fast changes in the river morphology. Therefore, the decision was taken to work on developing a method for predicting as well as possible the morphological changes, the movement of channels and sandbars based on field data and observations, also using rules and mechanisms learned from the scale model tests (PETERS 1988). The idea to work with simple rules was launched in the fifties but remained in an embryonic stage. The method was worked out in the seventies within the Mateba study and progressively improved and learned to the RVM technicians.

In the year 1988, when the proceedings of the Academy's symposium about maritime access were published, two unfortunate events occurred. On the one hand, there was the serious situation of navigability in the Mateba fairway, which was responsible for a dramatic three-week interruption of all maritime traffic to the ports of Boma and Matadi. On the other hand, the assistance by the hydraulic laboratories (Borgerhout and Châtelet) came to a halt with the end of Belgian cooperation. In order to restore the fairway, a cutter suction dredger was hired and could, together with the RVM trailing suction hopper dredgers, restore a safe navigation route. The assistance to RVM with the Mateba project stopped definitively in 1990. A new, although limited assistance, started again in 2008.

Meanwhile, at the start of the years 2000, new difficulties forced RVM to request the World Bank to finance another dredging contract. Unfortunately, the budget available was inadequate to dredge a durable fairway. RVM did not ask advice from the experts who had worked in the Mateba project and who had gathered a good understanding of the river behaviour. They would have warned about the difficulties arising from the layout of the new fairway. Since 2005, navigation conditions have degraded again and urgent action is needed, not only to restore good navigation conditions, but also to improve the RVM performance.

History of Dredging Works in the *Région Divagante*

Figure 2 shows the evolution of the minimum available depth in the navigation route and the dredged volume of sand for the years 1905-2009. It is worthwhile discussing this history, dividing it in periods, referring each time to this figure.

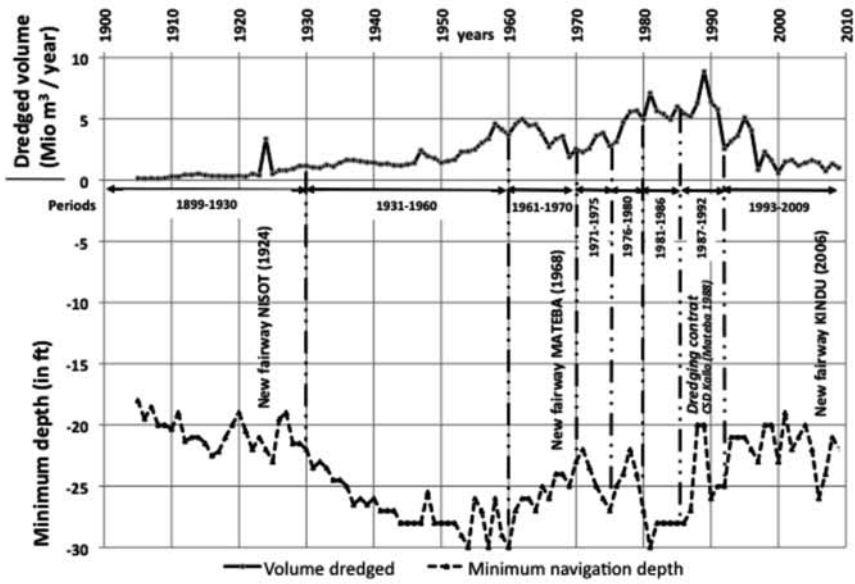

Fig. 2. — Changes in the minimum authorized draught (in ft) and the yearly dredging effort (in cubic metres sand per year) from 1905 until 2009 included.

PERIOD BEFORE 1930

The region downstream of Boma is in fact a kind of delta, which developed in geological times by siltation in the very deep Congo submarine canyon. This inland delta is called *Région Divagante* (wandering area) because of the high mobility of sandbars and channels.

Until the end of the 19th century, the water depths required for the ships of that time were small, so that no dredging was needed. Navigation followed the most adequate existing channels, sailors looking for the deepest crossings. In a significant part of the navigation route, depths are usually over thirty-three feet (ten metres) and thus sufficiently large. Only the sills (or crossings) are shallow and require maintenance dredging to keep the authorized draught at acceptable levels. At the start of the 20th century, dredging works were rather limited as the requested draught was below fifteen feet, which corresponds almost to the minimum depth observed on the crossings. Yearly dredged volumes amounted to

only 100,000 m^3 sand. This volume increased progressively to about 500,000 m^3 in 1930 to cope with the evolution of ship draughts. The dredge 'Nisot' cut made in 1924 was the first capital dredging of almost three million cubic metres for opening a fairway partly through a sandbar, thus not following the natural thalweg. Nisot had observed that the sand in the new southern route was much coarser than in the northern Mateba route. It made dredging easier, in a more stable channel. The new fairway was straight over a large length, which was another advantage because it avoided, at least for some time, the mobility of the channel, typical of a meandering route.

Period 1931-1960

From the early 1930s, hydrographical surveys and studies intensified, so that dredging became more efficient. The official draught offered to navigation could be brought to twenty-six feet or more. A minimum draught of thirty feet seemed to be the attainable target, which was reached in the mid-1950s. This was the result of efficient dredging by experienced dredgers, based on good surveys and studies by experienced hydrographers. Besides, the river morphology was favourable for achieving this result. In fact, with a favourable morphology, the flow scours and deepens the crossings (the "self-dredging capacity" of the flow). Unfortunately, because of a negative morphological evolution, the yearly dredging effort required to keep these good draughts increasing steadily during the fifties from two million cubic metres in 1950 to four million cubic metres in 1960.

Period 1961-1970

After the country's independency in 1960 and with the departure of experienced hydrographers and dredgers, a difficult period started, which was aggravated by a temporary change in the hydrological regimen of the Congo River. During the flood of 1961-1962, the peak discharge reached 80,000 m^3/s, which was much larger than the previously estimated centenary discharge. Figure 3 shows the changes in maximum water levels at Boma gauging station.

With its higher discharges, the decade 1960-1970 produced strong sediment transport and faster morphological changes. The official draught offered to maritime traffic dropped due to the poorer performance of the ageing dredging fleet, but also because of unfavourable morphological changes and reduced hydrographical activities. In 1970, the official minimum draught was only twenty-three feet instead of the thirty feet in 1960 and almost the same as in 1930. It became tough to maintain the southern fairway used since 1924. Luckily, a favourable morphology developed in the northern Mateba region and a new navigation route could be opened quite easily in 1967-1968. This was the start of the 'Mateba' project.

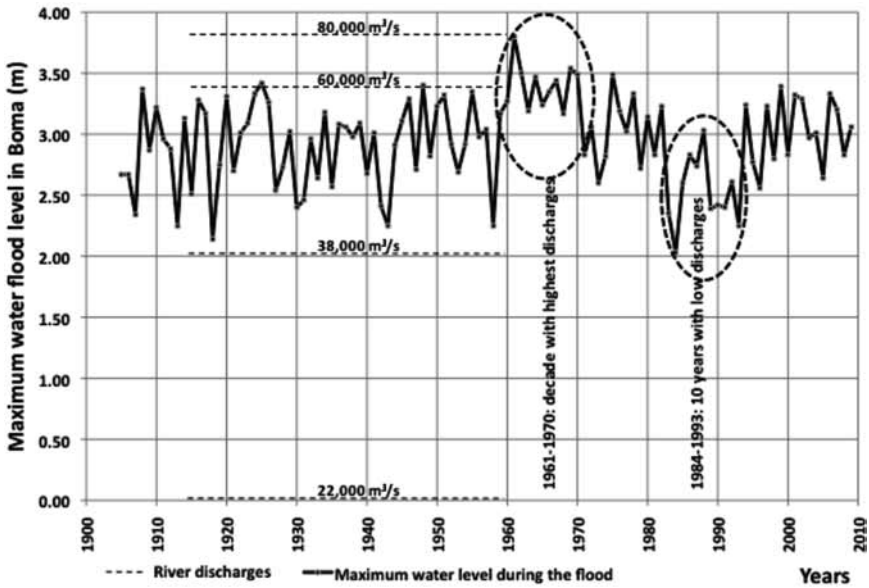

Fig. 3. — Evolution of the highest water level observed at the gauging station of Boma. The average discharge of the sixties was 13.5 % higher than over the previous sixty years. Between 1984 and 1993, levels were lower.

Period 1971-1975

With a World Bank project, the responsibilities for the maritime access of the Congo River to the Congolese Ports were transferred from the national Waterways Department to a newly created state-controlled company *Régie des Voies Maritimes*. The organization of the RVM services improved, especially the hydrographical surveys and studies with the assistance of the Belgian hydraulic laboratory. Moreover, two new trailing suction hopper dredgers, Banana and Mayumbe, financed by the European Development Fund, were delivered in 1971, boosting the dredging capacity of RVM. The official draught was brought back to twenty-seven feet in 1975, which was similar to the average of the period 1940-1960.

Period 1976-1980

In 1976, a new trailing suction hopper dredger, Tshuapa, was delivered and joined the Mayumbe and Banana. Despite the then significant available dredging capacity, a loss in draught of five feet occurred between 1975 and 1978, from twenty-seven to twenty-two feet. This could be partly explained by an unfavourable morphological situation, although the main reason was that the

hydrographical surveys and studies had been neglected by RVM. The catastrophic situation in 1977 forced the RVM management to take action. Another new trailing suction hopper dredger, Kasai, was delivered in 1978. With intensive surveys and studies, it was possible to design a dredging plan that allowed to recover the five feet lost in 1980, back to twenty-seven feet. The yearly dredged volume had passed from about two million cubic metres in 1970 to more than seven million cubic metres in 1981.

PERIOD 1981-1986

With the optimal use of resources and an efficient dredging work based on good hydrographical surveys and studies, but also thanks to an improved RVM management, minimum draughts of twenty-eight feet could be maintained until 1986, even thirty feet in 1981.

PERIOD 1987-1992

A new unfavourable morphological evolution in Mateba Amont between 1986 and 1987 put an end to this happy situation. Figure 4 shows a comparison of the *Région Divagante* between 1968, when the nicely meandering new fairway Mateba Amont was opened, and 1986 when the shape of the navigation channel was very bad. In 1987, the maritime access to the ports of Boma and Matadi was interrupted for three weeks. The draught dropped from twenty-eight to twenty feet. Based on a careful analysis of hydrographical surveys, a plan was developed in 1988 to intervene in the natural morphological evolution, working against nature for stopping (*I*) the further development (opening) of some side channels (*Faux-Bras*) inappropriate for navigation and (*II*) the narrowing of the existing navigation channel *Passe Jonction* (indicated as 'P.J.', extreme left side in figure 5). This plan was impossible to implement with the RVM training suction hopper dredgers and a cutter suction dredger (the CSD Kallo) was hired. A volume of 8.87 million cubic metres sand was excavated in 1989. A large part of the sand removed with the CSD Kallo was placed in the side channels *Faux-Bras*. The outcome was successful and a nicely meandering fairway could be established in 1990, with a draught of twenty-six feet (fig. 6). This shows how a well-managed dredging work based on a thorough analysis of a comprehensive set of hydrographical surveys and with a profound expertise gained in the field can turn a hopeless situation into a positive one. If the natural evolution had continued, all maritime traffic to the ports of Boma and Matadi would have been interrupted for a long time, possibly for months. An alternative fairway did not exist and creating a new and safe navigation route would have only been possible at a very high cost, with tenths of millions cubic metres' dredging. This good result was maintained for several years with the RVM dredgers, until 1992.

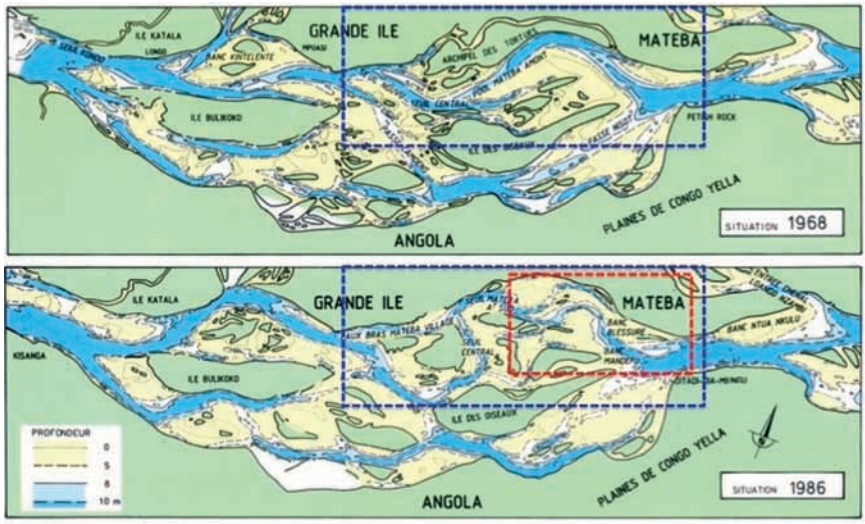

Fig. 4. — Morphological evolution 1968-1986; blue windows compare dramatic changes in Mateba Amont; red window shows the area where major difficulties requested an intervention of the cutter suction dredger CSD Kallo in 1986 (see fig. 5).

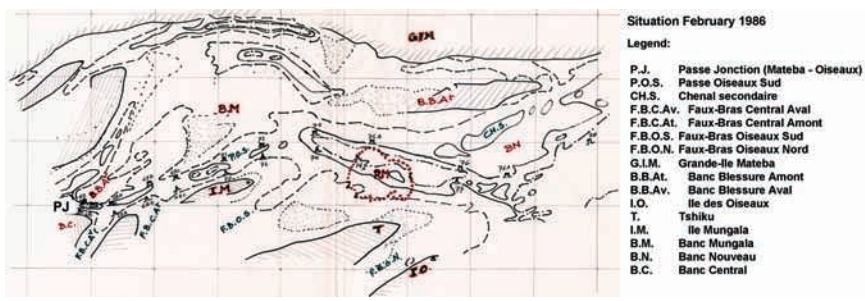

Fig. 5. — Field sketch of the area presenting major dredging difficulties in 1986 (see the red window in fig. 4).

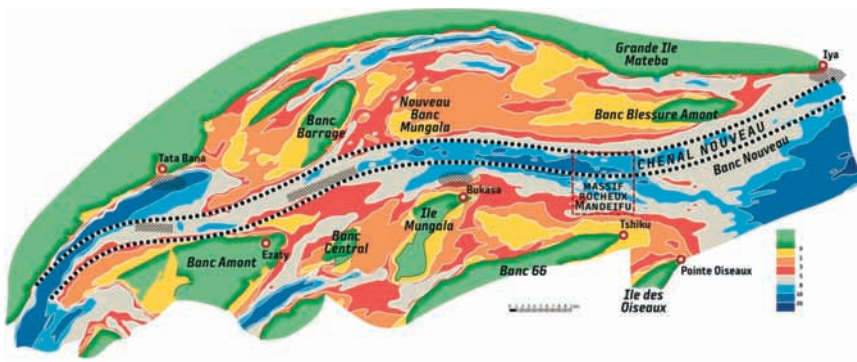

Fig. 6. —Smoothly meandering fairway Mateba after dredging operations 1988-1989 with the CSD Kallo and the RVM dredgers Tshuapa, Kasai and Banana.

Period 1993-2009

During this period, the RVM dredging performance was very poor. This can be partly explained by the troubled political situation, the halt of Belgian cooperation and its Mateba project, the shortage of resources for hydrographical surveys and studies, an inefficient maintenance of dredging tools.

Yearly dredged volumes dropped significantly from 5.8 million cubic metres in 1991 to 1.4 million in 2008. After 1992, the minimum draught authorized in the fairway remained below twenty-three feet until 2006. In 2003, navigation conditions worsened so much that RVM requested a loan from the World Bank for hiring a trailing hopper dredger. The goal was to help the RVM dredgers to restore acceptable navigation conditions in the Mateba fairway. However, at the initiation of works, RVM requested the contractor to open a new southern navigation route, almost the same Nisot fairway that had been abandoned in 1968 (fig. 7). This decision was taken by RVM on the basis of a limited number of hydrographical information. Only the first part 'Kindu' of the former Nisot cut could be made, because the funds available did not allow a dredge cut through the Bunia sandbar. At the end of the 'Kindu' cut, the fairway turned therefore to the left, passing between two stable islands called 'Canards' (the downstream one is called also Mukubua, see fig. 8).

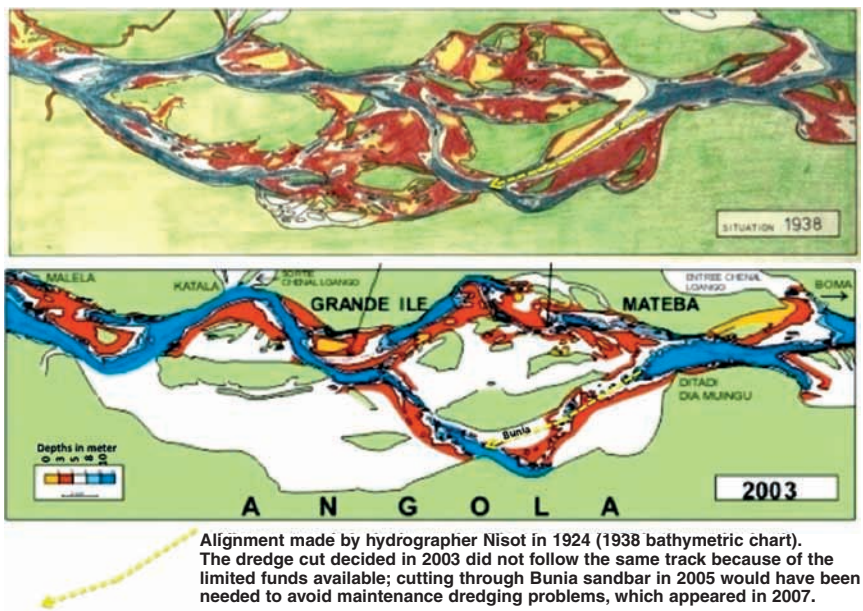

Fig. 7. — Comparison between bathymetric charts of 1938 and 2003.

The opening of the southern route in 2005 was celebrated as a victory, since RVM had abandoned the difficult Mateba route for one that was supposed to be

a stable fairway, as had been the Nisot route for forty years. Nonetheless, problems arose quickly in the *Passe Canards* crossing, squeezed between the two Canards Islands and threatened by a large sandbar (*Banc Kindu)* that would in any case move in seaward direction (fig. 8).

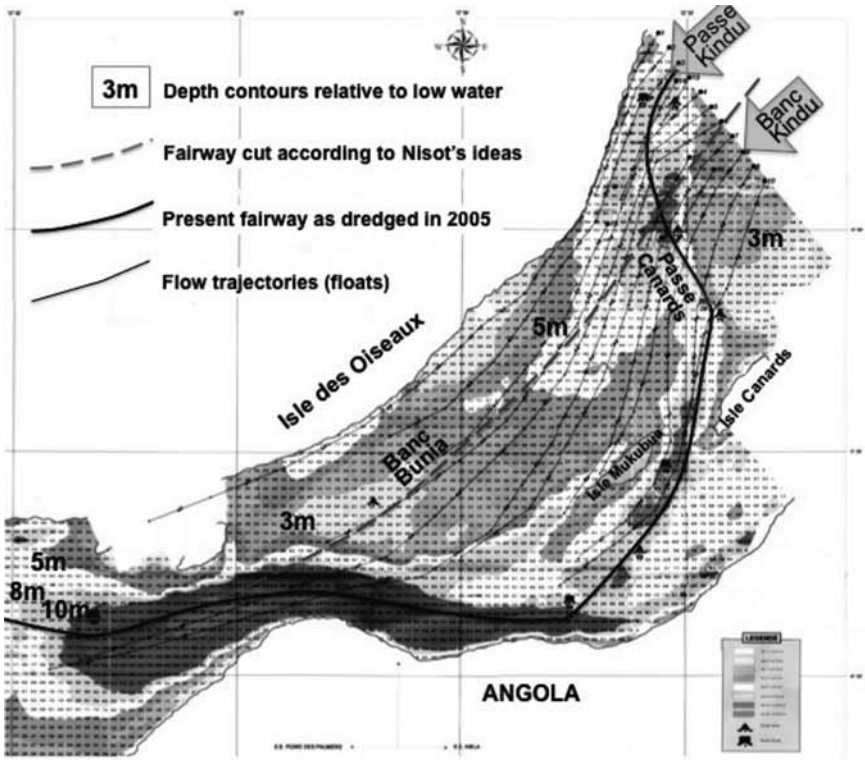

Fig. 8. — Bathymetric chart with float tracks and fairways (dating 13 November 2008). *Passe Canards is* a dangerous crossing. Isle Mukubua and Isle Canards are stable islands. The arrow *Banc Kindu* indicates the direction in which the sandbar wants to move.

In 2008, during a mission organized within the project 'Twinning Ports of Matadi/Boma and Antwerp', RVM was warned about the risk that would represent a sliding of the Kindu sandbar into the *Passe Canards* crossing. RVM was not able to take appropriate action as its dredgers had to be repaired. Dredged volume dropped to about one million cubic metres in 2009 and remains too low in 2010; only the Banana is capable of doing some dredging work.

The most dangerous period for such sandbank sliding is always during the flood season, at the peak of the flood or immediately after it. In fact, the Kindu sandbar might be destabilized in case the flow passing over its top would reach large enough velocities. In 2008, the danger was said to be the highest for flood

levels exceeding significantly 3 m at the water level gauging station of Boma. By chance, this did not happen in 2008 or in 2009. Kindu sandbar could have been destabilized during the previous floods of 2006 and 2007, when maximum flood levels reached respectively 3.33 m and 3.20 m (see fig. 3), but at that time the sandbar did not have its present large size yet.

Morphological Dredging as a Tool for Maintaining Good Navigation Conditions

Since the 1930s, hydrographers and dredgers have realized that only working with nature could ensure sufficiently good navigation conditions, basing dredging strategies on the best possible understanding of morphological processes. This approach is not always well understood by managers and economists, even by dredgers not familiar with this peculiar river. During a World Bank mission, the WB economist requested a relationship between a varying target draught and the dredging volume to ensure this. The targets were defined as twenty-eight feet during ten months in a year, twenty-six feet for the remaining months, usually at the peak of the flood or immediately after, *i.e.* between 15 December and 15 February. Using all the data available from 1899 until 1988, a graph was produced (fig. 9), revealing that there is no unique relationship, because the dredging effort is determined by the "morphological health" of the *Région Divagante*, when the shape of channels is such that self-dredging capacity of the flow in the crossings is high. When morphology is favourable, a minimum draught of thirty feet can be ensured for the whole year with only two million cubic metres, while more than seven million cubic metres may be needed under unfavourable morphological conditions.

In the graph of figure 9, it can be observed that period 1899-1950 may be considered as very favourable, while 1986-1988 was very unfavourable. The strategy developed by the hydraulic laboratories of Borgerhout and Châtelet in the Mateba project aims at using dredging as a tool to steer morphology, enhancing the natural trends when they seem positive, countering them when they seem negative (as was done in 1989-1990, see above). Dredging is not only to keep the target depth on crossings, but also to influence the morphology so that self-dredging capacity would be maximized and dredging effort kept as low as possible. During the work of the CSD Kallo, the edge of a steep sandbar, which was ready to collapse, was cut away (against the natural movement of the sandbar) and the dredged sand deposited in secondary channels. These were enlarging dangerously at that time, diverting significant flow and reducing thus the self-dredging capacity in the main channel used for navigation. This kind of strategy is not common elsewhere.

It must be mentioned that the idea of organizing dredging work on the basis of hydrographical surveys and observations was already applied sixty years ago, as

described in Devroey (1957). Hydrographer A. Khokhloff had worked out the basis of the method, which he called MEDRADI (*MEthode des DRAgages DIrigés*, method of steered dredging). The idea was taken over in the Mateba project and further developed in a more scientific way, as the understanding of the river improved with the many field surveys and also with the observation of scale-model simulations (Peters 1988, Peters & Wens 1991).

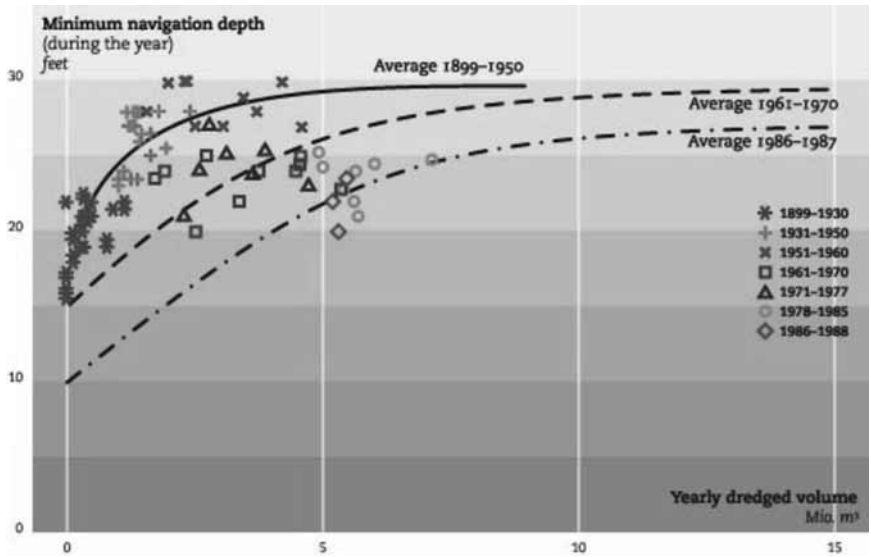

Fig. 9. — Relationships between the dredging effort during a given year (in millions of m^3) and the minimum draught observed during that year (in feet).

Some may argue that all dredging is 'morphological', as it is based on hydrographical surveys. However, the method for analysing the past morphological changes and predicting future evolutions, using a large array of field measurements, is quite unique and based on a thorough understanding of fluvial processes. The continuous processing and analysis of bathymetric charts, flow and sediment transport data, water level and slope, bed-form tracking, sediment samples, evolution of the shapes of crossings and sandbars and so many other data allows to organize the dredging work in an optimal way. Understanding the river behaviour is a key element, based on field observations and on fluvial processes learned from the scale-model tests.

The result of training RVM engineers and technicians during twenty-two years from 1968 to 1990 is still well visible today. Obviously, over the past two decades, part of the trained personnel left or disappeared and the technical capacity of RVM was reduced. The lack of means, vessels and equipment, has paralyzed the work of the hydrographical department. Morphological dredging is not possible under the present situation, though it is needed more than ever.

The rising criticism about the present inability of RVM to maintain sufficient navigation conditions is understandable, certainly because the users are paying high duties to access the Congolese ports. The shipowners and other actors mention the poor dredging efficiency as the main reason for the insufficient draught in the fairway. They do not realize that even with sufficient dredging capacity and large volumes dredged, it would not be possible to achieve a significant draught if dredging was not based on good hydrographical analysis, thus on sufficient surveys. For example, an increase in the volume of sand dredged on the *Passe Canards* crossing may bring the draught to twenty-six, eventually twenty-eight feet, but it will not prevent the sliding and the collapse of the Kindu sandbar (see fig. 8). Deepening of the crossing could even accelerate this collapse. If this would occur, the available allowed draught could drop to less than eighteen feet, possibly less than fifteen feet and all maritime traffic to the ports of Boma and Matadi would be interrupted during weeks, possibly months.

Measures to Restore and Ensure Good Navigation Conditions

Urgent measures must be taken to improve maritime access to Congo. More and more, the alternative offered by a deep-sea port downstream of the *Région Divagante* is mentioned. Its location would be between the mouth (Banana) and the downstream limit of the *Région Divagante*, at Malela, the end of the submarine canyon (see fig. 1). Several alternatives are being investigated. The first project for a port in Banana dates from 1929 and many others have been studied. Nevertheless, even with the construction of a deep-sea port, Boma and Matadi will not disappear. A navigation channel, possibly with less draught (26/24 feet), would in any case be needed. RVM has thus to recover its capacity to maintain good navigation conditions in the *Région Divagante*. There are many challenges at present (see below).

Dredging Department and Shipyard

RVM is taking action for repairing its fleet, in priority its dredgers that were poorly maintained. On the one hand, the Belgian Federal State Department for Foreign Affairs, Foreign Trade and Development Cooperation has made available a budget for the procurement of spare parts for the most urgent needs to repair RVM dredgers. On the other hand, RVM has to improve the running of its shipyard and the maintenance of its fleet.

Hydrographical Department

Since 2008, RVM has made an effort to improve maintenance and repair of its hydrographical vessels. Renewal of this fleet is needed, especially smaller units for bathymetric surveys and hydrometric measurements, also for sediment trans-

port. RVM needs assistance to set up the technical specifications of survey vessels to avoid the kind of recent bad bargain when a new vessel for soundings was ordered. The hull's shape of this workboat is inadequate, producing turbulence that disturbs the echo-sounding work.

In 2010, the Belgian Federal State Department for Foreign Affairs, Foreign Trade and Development Cooperation has made available a budget for improving the running of the hydrographical department. It includes training RVM hydrographers, monitoring the Congo River morphological developments and the procurement of some hydrographical equipment. The most urgent need is to map the entire *Région Divagante*, not only the fairway, but also the smaller channels and shallow areas. This complete bathymetric survey was made previously every two years from 1932 to 1988. Nothing was made after 1988, thus for more than twenty years. Because of this, RVM cannot detect in time the natural tendency in the development of new fairways. Today, the possibility of a new one has been detected in the southern region, more downstream of Kindu-Bunia, in a pool where no navigation route was ever established.

RVM hydrographical staff are capable of carrying out almost all surveys needed, but they are short of the vessels and instruments in good condition. With the budget made available on top of its own resources, RVM should upgrade its hydrographical equipment, including some newer technology. During one of the missions fielded by the port of Antwerp, new float tracking techniques with GPS were demonstrated successfully. Obviously, personnel will have to be trained, but the new technologies will enhance the productivity of surveys.

Knowledge Transfer and Training

Survey data must be analysed, morphological evolutions understood and future changes predicted. This requires a skilled staff with many years of expertise. Fluvial processes are still not fully understood, so that expertise must be gained on-the-job (learning-by-doing). A first, though elementary two-week training was given in Antwerp in June 2008 to fifteen staff members of the hydrographical department. For some older staff, it was refreshment of what they had learned in the Mateba project. Thanks to the missions fielded by the port of Antwerp, more surveys were carried out according to the methodologies developed in the Mateba project. Obviously, this regain in activities is hampered by the lack of means. However, the morphological analysis of the difficult *Passe Canards* crossing could be done on the basis of bathymetric charts combined with flow trajectories, as shown in figure 10.

Unfortunately, RVM did not have the dredging equipment available to make the proposed dredge cut.

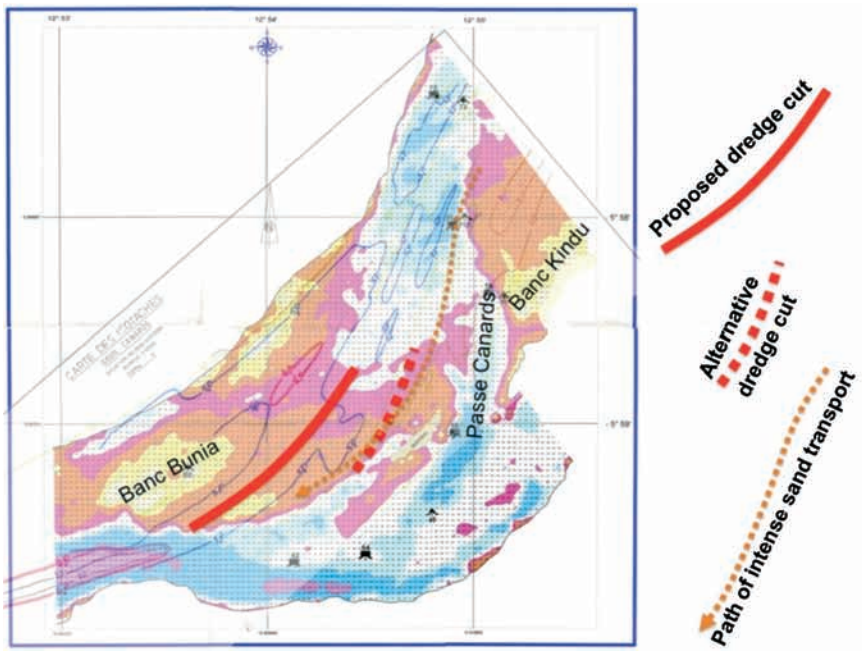

Fig. 10. — Example of a morphological analysis based on a 2009 bathymetric map combined with float tracks; velocities are used to draw equal velocity lines; this helps detect a possible alternative navigation route cut through Bunia sandbar.

What Next?

The present situation of the fairway (May 2010*) is critical and urgent action is needed. The shipping companies and stakeholders are losing patience. Coordinated actions are needed in many fields. RVM must be assisted, though it must take action.

Since 2008, it has been planned to hire a dredger for assisting RVM in recovering an acceptable draught in its fairway, bringing it from the present twenty feet to at least twenty-four feet, or better twenty-six feet. However, since the idea of hiring a dredger was launched, the river has changed. The cut planned in 2008 is not valid anymore. The result of this work must be sustainable. There is a real risk of having a contracted dredging work useless if not prepared on the basis of a thorough morphological analysis.

Besides this emergency dredging work, the shipyard's running must be boosted up in the short term. This is not only an issue of equipment, but also of per-

* Meanwhile, a dredger was hired, which could re-establish an official draught of 23 feet in March 2011 after eight weeks of intensive dredging. In January 2011, the draught had fallen to 18 feet.

sonnel. The assistance promised by Belgium will produce results in the medium term. Besides, there is the need to plan already today the progressive renewal of the means and tools to make RVM a more modern and efficient company. External assistance will be further needed. The oldest trailing suction hopper dredger, Banana (fig. 11), is getting old and its sister-ship Mayumbe was decommissioned years ago. Poor maintenance is obviously the main reason for the ageing of RVM dredgers. Nonetheless, RVM must consider the procurement of at least one additional dredger in order to be able to maintain a safe navigation route when the river's morphology is unfavourable.

Fig. 11. — Trailing suction hopper dredger Banana (date of construction, 1971).

It is of utmost importance to safeguard the experience and knowledge that has been gathered about the *Région Divagante* for more than a century. This means that a thorough transfer of knowledge and experience is needed, from the older generations to the new staff. A critical part of this knowledge and experience lies today outside Congo, mainly with the experts who have contributed to the Mateba project. It must be said that during that project, tremendous efforts have been devoted to collect, control, copy, analyse and archive the historical data from before 1968 and the new ones gathered since then. This database is now carefully stored in safe conditions and well inventoried at the hydraulic laboratory of Borgerhout. It should be duplicated and put in electronic formats to be transferred to RVM. The European Union or Belgium could finance this task. The archives contain other valuable hydrological, hydraulic and topo-bathymetrical information and data about the rivers in the Congo basin.

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