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International Court of Justice

THE HAGUE

Cour internationale de Justice

LA HAYE

YEAR 2015

Public sitting

held on Friday 17 April 2015, at 10 a.m., at the Peace Palace,

President Abraham presiding,

***in the cases concerning* Certain Activities carried out by Nicaragua in the Border Area (Costa Rica *v.* Nicaragua); Construction of a Road in Costa Rica along the San Juan River (Nicaragua *v.* Costa Rica)**

VERBATIM RECORD

ANNÉE 2015

Audience publique

tenue le vendredi 17 avril 2015, à 10 heures, au Palais de la Paix,

sous la présidence de M. Abraham, président,

***dans les affaires relatives à* Certaines activités menées par le Nicaragua dans la région frontalière (Costa Rica c. Nicaragua) ; Construction d'une route au Costa Rica le long du fleuve San Juan (Nicaragua c. Costa Rica)**

COMPTE RENDU

Present:	President	Abraham
	Vice-President	Yusuf
	Judges	Owada
		Tomka
		Bennouna
		Cançado Trindade
		Greenwood
		Xue
		Donoghue
		Gaja
		Sebutinde
		Bhandari
		Robinson
		Gevorgian
	Judges *ad hoc*	Guillaume
		Dugard
	Registrar	Couvreur

Présents : M. Abraham, président
M. Yusuf, vice-président
MM. Owada
Tomka
Bennouna
Cançado Trindade
Greenwood
Mmes Xue
Donoghue
M. Gaja
Mme Sebutinde
MM. Bhandari
Robinson
Gevorgian, juges
MM. Guillaume
Dugard, juges *ad hoc*

M. Couvreur, greffier

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as Agent;

H.E. Mr. Sergio Ugalde, Ambassador of Costa Rica to the Kingdom of the Netherlands, Member of the Permanent Court of Arbitration,

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Le PRESIDENT : Veuillez vous asseoir. L'audience est ouverte. La Cour se réunit ce matin pour la poursuite du premier tour de plaidoiries du Nicaragua. Je vais donner d'abord la parole à M. Reichler.

Mr. REICHLER:

THE EVIDENCE REGARDING NICARAGUA'S DREDGING OF THE SAN JUAN RIVER

1. Mr. President, Members of the Court, good morning. My subject today is Nicaragua's dredging programme and it will be divided into two parts. In the first part, I will discuss the evidence showing that dredging of the Lower San Juan River, as Nicaragua has been doing for the past four-and-a-half years, is necessary for navigation, and for maintaining a sufficient flow of fresh water downstream to the internationally recognized and protected wetlands on both sides of the river, which depend on those waters for their environmental health and ecological balance.

2. In the second part of my presentation, I will discuss the evidence that refutes Costa Rica's allegations that the dredging programme, as carried out by Nicaragua, has caused, or is likely to cause, harm to Costa Rica. As you will see, Mr. President, the evidence, including evidence supplied by Costa Rica's own expert, Professor Thorne, establishes conclusively that there has been no such harm; nor is there likely to be any in the future.

I. The need for dredging

3. In regard to the need for Nicaragua's dredging programme, I will begin with the evidence supplied by Costa Rica's expert. In his summary report, submitted on 16 March, Professor Thorne described the Lower San Juan as a "declining river"[1]. He elaborated on this in his main report, annexed to Costa Rica's Memorial. In that report, he concluded that the Lower San Juan is progressively silting up and losing its conveyance capacity because it is "unable to accommodate" the heavy load of sediment it receives from upstream. This sediment is "deposited in and along the (mainly meandering) channel in the form of shoals, islands, point bars and natural levees"[2]. On Tuesday, during his cross-examination, Professor Thorne told us that the Lower San Juan River is

[1]Thorne Summary Report for *Certain Activities* case, March 2015, para. 2.4.

[2]Thorne October 2011 Report, p. II-27.

so full of sediment that it cannot be navigated in the dry season: "A channel that is navigable during the wet season may not be navigable during the dry season, as is the case for the Lower Rio San Juan itself." (P. 25.)

4. Professor van Rhee, Nicaragua's dredging expert, whom you will meet this morning, agrees with Professor Thorne. In his summary report, Professor van Rhee calls the Lower San Juan

> "a zone of increasing sediment accumulation and, as a result, continually reduced flow. This is because the river downstream from the bifurcation [where most of the water flows into the Colorado River] receives more sediment than it can transport, such that the excess settles and accumulates."[3]

5. Professor van Rhee calls the accumulation of sediment in the lower stretch of the river

> "self-perpetuating, because the deposition and accumulation of sediment reduces flow in those reaches, decreasing the river's transport capacity, which in turn promotes further sediment deposition. The problem thus worsens as the amount of sediment reaching the Lower San Juan increases."[4]

Professor Thorne agrees.

6. The evidence shows that by 2008 Nicaragua's environmental regulatory authorities had concluded that sedimentation of the river "poses serious problems for navigation"[5]. Municipal authorities had identified certain stretches where "boats run aground", especially "in the summer [that is, the dry season] due to the loss of water flow . . . Sometimes boats will remain for hours or days before reaching their final destination."[6] In one stretch, in particular, there were numerous sandbars, and depths of less than 0.3 m were recorded[7].

7. Both Parties' experts, Professor van Rhee and Professor Thorne, agree that:

> "Sedimentation and consequent reduced flow impede navigation of the river"[8] such that, in the Lower San Juan "continuous dredging is required . . . because sediment accumulation does not cease after the initial dredging has been carried out.

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[3]Van Rhee Summary Report, 15 March 2015, para. 4.

[4]*Ibid.*

[5]MARENA Administrative Resolution No. 038-2008, 22 Dec. 2008, submitted as Ann. 33 to Nicaragua's Counter-Memorial, CMN, Vol. III, p. 81.

[6]Environmental Impact Study for Improving Navigation on the San Juan de Nicaragua River, Sep. 2006, p. 7; CMN, Ann. 7.

[7]Environmental Impact Study for Improving Navigation on the San Juan de Nicaragua River, Sep. 2006; pp. 16 & 119; see also EPN 2014 Annual Report, p. 4 (noting the "shallow depth (less than two feet) and the presence of areas with sandbanks" in this stretch).

[8]Van Rhee Summary Report, 15 March 2015, para. 6.

> Maintenance of navigability requires ongoing removal or relocation of newly deposited sediment."[9]

8. In Professor Thorne's words: "maintaining navigation in the Río San Juan for vessels with drafts greater than, say about 1 m, will require not a single, capital operation but repeated dredging and the removal of hundreds of thousands of cubic metres of sediment year after year"[10]. As Professor Thorne explained in his first report:

> "The aims of dredging a river to improve navigation are to substantively increase the minimum depth in the navigation channel during low flow to a value greater than the draft of the largest vessel seeking passage and remove all sediment shoals and bars that could present a danger to shipping."[11]

9. Those are precisely Nicaragua's aims. Their modest nature should be underscored. Nicaragua is not aiming to dredge a channel sufficient to allow the passage of the QE II or the latest supertanker. Its programme is only designed to enable small vessels to navigate the lower reaches of the river, and ***to*** access the riverine communities and the village of San Juan del Norte at the river's mouth. For budgetary reasons, the original scope of the programme was reduced. It now covers eight small areas of the river — shown on the screen and at tab 1 of your judges' folder — within a 22-km stretch where the accumulation of sediment and resulting obstacles to navigation, especially in the form of shoals and sandbars, are particularly problematic. And you can see these areas before you. [Screen on: fig. 5.3 from CMN, p. 225.]

10. There is no plan to widen the river, or disturb the Costa Rican bank in any way. The programme calls for the restoration of a small navigation channel within the river, that is no more than 30 m wide at the top, ***and*** 20 m wide at the bottom, and 2 m deep[12]. In the Project Design Study for the dredging programme, which was part of the Environmental Impact Study, produced in 2006, Nicaragua determined that this would produce an increase in flow of 2 per cent, and that this would be sufficient for the small boats that navigate this portion of the river[13].

11. Just as the dredging programme is essential for navigation, it is also necessary to maintain a sufficient supply of fresh water to the wetlands downstream, which depend on it for

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[9]Van Rhee Summary Report, 15 March 2015, para. 8.

[10]Thorne October 2011 Report, p. II-28.

[11]Thorne October 2011 Report, p. II-35.

[12]Environmental Impact Study for Improving Navigation on the San Juan de Nicaragua River, Sep. 2006, pp. 4, 6, 11-13; CMN, Ann. 7.

[13]Project Design Study, Sep. 2006, p. 18, CMN, Ann. 8.

their survival. The need to maintain the level of the San Juan's flow of water to these wetlands was underscored by Ramsar, in its report of December 2010. I quote Ramsar: "It is crucial to maintain the river discharge and patterns of the San Juan River upstream of the [Humedal Caribe Noreste — that is, the Ramsar site on the right bank of the river] in order to preserve it as a healthy and sustainable wetland in the long term."[14] Professor Thorne agrees: "[b]elow the Delta, the Río San Juan and Río Colorado support a linked system of distributaries, swamps, flooded forests, lakes, and coastal lagoons that makes up the wetlands of the Isla Calero that are part of the 'Humedal Caribe Noreste' (HCN) which was designated in 1996 as a wetland of international importance under the Ramsar Convention"[15].

12. As explained by Professor van Rhee:

> "Dredging, which is an effective technique for maintaining flows to wetlands, also serves to preserve the ecological health of the environmentally sensitive areas in the vicinity of the Lower San Juan River. Accumulation of sediment in the river has adverse consequences for the wetlands of international importance that are sustained by its flows."[16]

13. In sum, Mr. President, the evidence — including the reports of both Parties' experts and Ramsar — shows that Nicaragua's dredging programme is necessary both for navigation and for sustaining the wetlands downstream.

II. Costa Rica's allegations of harm

14. I turn next to the second part of my presentation, and address the evidence in regard to Costa Rica's allegations that it has been harmed, or is likely to be harmed in the future, by the dredging programme.

15. In its Memorial, Costa Rica presented a number of claims of different kinds of harm allegedly caused by Nicaragua's dredging of the river. But this week, they appear to have abandoned all of them, save one: that Nicaragua's dredging programme has caused, allegedly, a significant reduction in the flow of the Colorado River. This claim was repeated numerous times

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[14]Ramsar Secretariat, "Ramsar Advisory Mission Report No. 69: North-eastern Caribbean Wetland of International Importance (Humedal Caribe Noreste), Costa Rica", 17 Dec. 2010, submitted as Ann. 147 to Costa Rica's Memorial, Vol. IV, pp. 89, 131.

[15]Thorne October 2011 Report, p. vi.

[16]Van Rhee Summary Report, 15 March 2015, para. 10.

by Mr. Ugalde on Wednesday. I emphasize "repeated". Here are just a few examples; you can find them as well in tab 2 of the judges' folder:

16. "Nicaragua's dredging is intended to refashion the geography in the region of the mouth of the San Juan, in a manner which necessarily risks significant adverse impact on the Colorado River." (P. 56, para. 5.)

17. On the next page of the transcript: "The actual dredging programme will involve the drastic refashioning of geography with the strong likelihood of detriment to the Colorado River . . ." (P. 57, para. 11.)

18. Three pages later: "as Nicaragua has said — its aim is to refashion the geography of the Lower San Juan, with dramatic implications for the Colorado River" (p. 60, para. 21).

19. Four pages later, he refers to Nicaragua's "explicit stated intention to refashion geography and divert flow from the Colorado River" (p. 64, para. 41).

20. About these statements, Mr. President, several observations are in order. First, the rhetoric spirals upward with each iteration of the claim. From "risks [of] significant adverse impact," it escalates to "strong likelihood of detriment", and from there to "dramatic implications", and finally to "divert[ing] flow from the Colorado River".

21. The second observation is that no citations to the evidence are provided for any of these statements that I just read. None. There is not even a citation for Nicaragua's alleged "explicit stated intention". If it is explicit and stated, where is it? Nor is there one for "as Nicaragua has said". Where and when has Nicaragua said this? There is no evidence cited in the transcript to support these assertions. Not for any of them.

22. Now, Mr. Ugalde, who is my friend, is a man of many talents. As you have seen, he is a very talented advocate. And he is an equally talented diplomat. Unless he is much older than he looks, he has achieved the rank of ambassador at a remarkably young age, which is a notable achievement. He obviously has a brilliant career ahead of him, and given the history between these Parties, he may spend much of it in this Great Hall. But one thing he is *not* is a geologist, or a geomorphologist, or a hydrologist. Nor is he an expert witness, whose assertions constitute evidence.

23. So let us leave the rhetoric behind, and see what Costa Rica's real expert has said about the impact of Nicaragua's dredging programme on the Colorado River.

24. This was Professor Thorne's conclusion, set forth in his extensive written report, at the time Costa Rica filed its Memorial: "To date, there is no evidence that the dredging programme has significantly affected flows in the Río Colorado."[17] Now, that is a statement worth repeating; "no evidence that the dredging programme has significantly affected flows in the Río Colorado". And there is still no such evidence. Professor Thorne reviewed the report prepared by Professor van Rhee, in collaboration with Professor de Vriend, which calculated that the dredging programme would reduce the flow of the Colorado River by only 3 per cent[18]. Professor Thorne called this impact "negligible"[19].

25. In fact, Professor Thorne's main criticism of the Van Rhee/De Vriend report was that they should have used a more sophisticated methodology to calculate flow rates. He identified the method that he considered superior. Professor van Rhee then used Professor Thorne's method to recalculate the flow rates. The result was that the diminution in flow was not 3 per cent, it was 1.5 per cent. In other words, Professor Thorne's approach demonstrated that the impact on the Colorado River's flow was about half of the 3 per cent figure that he already regarded as "inconsequential". In his summary report of March 2015, Professor Thorne agreed with Professor van Rhee's recalculation, and called the reduction in flow "meagre". Mr. President, I do not really know the difference between "meagre" and inconsequential, if there is one; but I know that neither one means "significant".

26. There has never been any evidence in support of Costa Rica's claim. Costa Rica's own evidence has always defeated it. The Court will recall the evidence adduced at the oral hearing on Costa Rica's first request for provisional measures, in January 2011. In particular, there was a statement by the Foreign Minister of Costa Rica from 8 September 2010 in which he said that, at

[17]Thorne October 2011 Report, p. IV-3.

[18]See Van Rhee Summary Report, 15 March 2015, para. 19.

[19]Thorne October 2011 Report, p. vii.

most, Nicaragua's dredging programme would diminish the flow of the Río Colorado by under 12 per cent, which the Foreign Minister described as not a material impact[20].

27. The Foreign Minister's statement was based on a Costa Rican scientific study, also adduced at the January 2011 hearing, which calculated that if Nicaragua were to dredge the Lower San Juan to a width of 120 m, and a depth of 5 m, the flow of the Colorado would be diminished by less than 5 per cent[21]. That is Costa Rica's own scientific study. But to really appreciate what it says, it needs to be borne in mind that it makes two assumptions about Nicaragua's dredging programme that are not the case. First, it assumes that the Lower San Juan would be widened by Nicaragua from its current width of 90 m to 120 m. There has never been such a plan. Second, it assumes that the river would be dredged to a depth of 5.75 m, when the programme calls for a depth of 2 m. Even the much more expansive scenario hypothesized by Costa Rica's scientists produced a flow reduction of only 5 per cent. Recall, if you will, that the Foreign Minister considered a 12 per cent reduction immaterial.

28. And this brings us to the scenarios addressed by Professor Thorne, about which he was questioned by Judge Xue. Although I will be the first to affirm that Professor Thorne was a most co-operative witness, I believe he did not really answer Judge Xue's question about the baseline for these scenarios. The answer is this. The baseline is what he called in his report the "current conditions of rivers at the Delta". You can see that at the top of the top chart. As you can see from that chart — that is the top chart on the screen before you and in your judge's folder, at tab 2 — he assumed, for his baseline, that the actual width and depth of the Lower San Juan before dredging were 90 m and 4.75 m, respectively. These are now highlighted within the red rectangle. And he determined that, in current conditions, the Colorado River captured 84 per cent of the San Juan River's flow, while the Lower San Juan captured 16 per cent. Again, we are highlighting these, for the ease of the Court in following this on the screen.

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[20]Speech of Mr. René Castro Salazar, Former Minister for Foreign Affairs and Worship before the Environmental Commission of the Legislative Assembly, 8 Sep. 2010, pp. 5-6; CMN, Vol. II, Ann. 24.

[21]C.S. Diseño, "Study of flow behavior in the bifurcation San Juan River – Colorado River," p. 5. Spanish version submitted to the Court by Costa Rica on 7 January 2011; English translation submitted in Nicaragua's judges' folders on 11 January 2011 and as Ann. 11 to the Counter-Memorial.

29. The second chart, directly below the first, shows the various scenarios considered by Professor Thorne. He himself referred to them — on page 41 of Tuesday afternoon's transcript — as "three scenarios . . ." ***scenarios,*** exactly that,[2] as contrasted with the dredging programme that was actually approved and carried out. These scenarios turn out to be very similar, if not identical, to the modelling done by Costa Rica's own scientists in 2010. Dr. Thorne's dredging scenario 1 assumed a widening of the river from 90 m to 120 m, and dredging to a depth of 5.75 m. The results are shown in the third chart — the one at the bottom of the screen. Under the heading scenario 1, the flow of the San Juan River captured by the Colorado River is 80 per cent (as compared with the baseline of 84 per cent), and the flow to the Lower San Juan is 20 per cent (as compared with 16 per cent). Accordingly, under Professor Thorne's first scenario, the diminution of the Colorado River's flow is a mere 4 per cent. But, as I have said and Professor Thorne agrees, when you factor out the supposed widening of the river to 120 m, which did not occur and has never been planned, and the dredging of a 5.75 m channel, and you apply Professor Thorne's preferred methodology for determining flow rates, the reduction in flow is only 1.5 per cent. Even less than "inconsequential".

30. Professor Thorne's second and third scenarios stray even farther from the actual project. Scenario 2, for example, assumes a widening of the river to 150 m, and a channel that is 6.75 m deep. Scenario 3 assumes an even wider river and deeper channel. They have no bearing on this case.

31. As Professor van Rhee has explained:

> "Professor Thorne's most optimistic scenario [that is scenario 1], which resulted in the predicted diversion of . . . 4 per cent, assumed the project would expand the river's width to 120 m and deepen it to 5.75 m . . .
>
> These assumptions are mistaken. The project is limited to dredging *within the existing river* a navigation channel that is only 30 m wide at the top, 20 m wide at the bottom, and 2 m deep. Conservatively modelled, this results in a diversion of only 20-50 m^3/s, representing approximately 3% of the Colorado's flow. Professor Thorne accepts that a reduction of this amount 'would be negligible.' In fact, the impact would likely be even less. More realistic modelling suggests a reduction in the Colorado River's flow of less than 1.5%."[22] (Emphasis added.)

32. Thus:

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[22] Van Rhee Summary Report, 15 March 2015, paras. 18-19.

> "The amount of sediment removed by the dredging is not enough to meaningfully impact flow in the Colorado River, and Costa Rica's prediction of a significant diversion of flow from the Colorado has not materialized."[23]

On that, the experts of both Parties are agreed.

33. My friend Mr. Ugalde, apparently, is unimpressed by Costa Rica's own expert. Or, at least, he is unconvinced. He perseveres in the face of Professor Thorne's opposing views. He asserts that there are two distinct dredging programmes: the authorized programme, which he calls a "paper programme", and the "real project" which he says bears no relation to the authorized one[24]. But it was precisely the real programme that Professor Thorne was referring to when he wrote: "there is no evidence that the dredging programme has significantly affected flows in the Río Colorado"[25]. And it was the actual programme he was describing when he wrote, last month, that the impact of dredging on flow rates was "meagre"[26].

34. Undeterred, Mr. Ugalde displayed this chart on the screen, which was included at tab 103 of Costa Rica's judges' folder and we have provided, for the Court's convenience, at tab 3 of our folder this morning. About this chart, Mr. Ugalde said: "As you can see . . . the flow of the Colorado River has been reducing, year on year."[27] "The average annual flow for 2014 was still significantly below pre-dredging levels, far more than the 2 per cent assessed by Nicaragua's experts back in January 2011."[28] He went on to say, five times, that Nicaragua had never produced its own calculation of flow rates for the San Juan River above the bifurcation with the Colorado River, or below it, in the Lower San Juan[29]. Surely, he told the Court, Nicaragua either has these figures and is concealing them, or has it in its power to obtain them but is deliberately refusing to do so[30]. In these circumstances, he argued, Costa Rica is entitled to an inference that

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[23]Van Rhee Summary Report, 15 March 2015, para. 15.

[24]E.g., CR 2015/3, p. 58, para. 16 (Ugalde).

[25]Thorne October 2011 Report, p. IV-3.

[26]Thorne Summary Report, *Certain Activities* case, March 2011, para. 4.16 *(a)*.

[27]CR 2015/3, p. 62, para. 30 (Ugalde).

[28]CR 2015/3, p. 62, para. 31 (Ugalde).

[29]CR 2015/3, pp. 60-62, paras. 23-29; p. 63, para. 33 (Ugalde).

[30]CR 2015/3, p. 62, para. 29 (Ugalde).

these calculations would show that the dredging programme is having a significant impact on the Colorado River's flow[31].

35. Again, Mr. President, several observations are in order.

Pardon me, Mr. President, I am sorry about all the water breaks but I think I caught whatever it was that Ambassador Argüello was suffering from yesterday, so I hope you will indulge my frequent recourse to the glass of water.

Several observations are in order. First, my friend confuses correlation with causation. This is the logical fallacy of *post hoc, propter hoc*. It has been said that "correlation does not imply causation, but it does waggle its eyebrows suggestively". And there is no doubt about what Costa Rica is trying to suggest here.

36. Second, it is simply not true that Nicaragua failed or refused to produce its calculations of flow data, or give them to Costa Rica. Projected on the screen is the final page of Annex 16 to Nicaragua's Counter-Memorial, submitted on 6 August 2012. This is a report by INETER, the Nicaraguan Institute for Territorial Studies, dated 26 June 2012. This page includes a chart of flow rates, and much more, as you will see, from 2006, 2011 and 2012.

37. I would direct your attention, in particular, to the bottom two lines of the chart, which show the volume of water — that is, the flow data — in the San Juan above and below the bifurcation. The difference, of course, is what flows into the Colorado. As you look across the chart from left to right in the penultimate line, you can see that the volume of water above the bifurcation steadily and substantially decreases from 2006, where it is 1643.567 cubic metres per second to 2011, where it is 1201.969 cubic metres per second — approximately a 20 per cent decrease — and then to 2012, where it is 711.678 cubic metre per second, an additional 35 per cent decrease. Then, correspondingly, the water in the Lower San Juan also decreases from 177 cubic metres per second in 2006, to 116 in 2011 and then to 65 in 2012, an overall decrease of more than 50 per cent during this six-year period. This has nothing to do with dredging. It has everything to do with the volume of water entering the San Juan River, above the bifurcation, from its main tributaries in Costa Rica, and, especially, from rainfall. Even Mr. Ugalde acknowledges

[31]CR 2015/3, p. 63, paras. 35-38 (Ugalde).

that the figures on his own bar chart are "*not proof* that the proportion of the total flow of the San Juan River prior to the Delta has reduced; other factors are relevant, most obviously the amount of rainfall, which affects the overall flow volumes"[32] (emphasis added). Significantly, Professor Thorne has observed in his summary report that "between December 2010 and June 2013 . . . the weather during this period was much drier than usual"[33]. There is the culprit, the lack of rainfall.

38. Third, the mortal blow to Costa Rica's suggestive bar chart, and to Mr. Ugalde's argument that the dredging programme has a significant impact on the Colorado River, if an additional mortal blow is needed, is supplied by the "Observations" at the end of the INETER report. These are based on the flow data just reviewed. The first one is:

> "Measurement of liquid volume carried out on 1 August 2006 reflect that the volume of the Colorado River is 1,466,155 m3/s. This is based on subtracting from the measured volume of waters in the upper Rio San Juan delta, the measured volume of waters in the lower south Rio San Juan delta. The result of this exercise indicates that the liquid volume of the Rio San Juan of Nicaragua past the delta of the Rio Colorado was equivalent to 12% of the volume of the Colorado River."

39. The same exercise was repeated as reflected in the second observation as of 24 January 2011. I will read from the last sentence: "This simple exercise indicates that [the] volume of water of the Rio San Juan of Nicaragua past the delta of the Rio Colorado was equivalent to 10.7 per cent of the volume of the Rio Colorado." That is, the volume of water in the Lower San Juan *decreased* as a percentage of the volume of the Colorado between 2006 and 2011. The opposite of what Mr. Ugalde and his suggestive bar chart would like you to believe. And, as in the third observation, the exercise was performed again as of 26 April 2012: "The result of this exercise indicates that [the] volume of water of the Rio San Juan of Nicaragua past the delta of the Rio Colorado was equivalent to 10.1 per cent of the volume of the Rio Colorado." This was a *further decrease* in the flow of the Lower San Juan relative to the Rio Colorado. Mr. President, it is absurd — a word my colleague and very long-time friend, Professor Pellet likes to use in his application of Cartesian logic to the other side's fallacious arguments, and the word is appropriate

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[32]CR 2015/3, pp. 62-63, para. 32 (Ugalde).

[33]Thorne Summary Report, *Construction of a Road* case, March 2011, para. 2.10.

here — it is absurd to argue in the face of this evidence that Nicaragua's dredging project has had an adverse impact of any kind on the Colorado River, let alone one that is significant.

40. And it is also absurd for Costa Rica to continue to assert that Nicaragua has failed to provide, concealed, or refused to obtain, critical evidence regarding flow data in the San Juan River, above or below the bifurcation. What makes this even more absurd is that this very document, this INETER report that we have just examined, was not only provided as an annex to our Counter-Memorial two-and-a-half years ago, but it is mentioned in a footnote in Mr. Ugalde's own speech.

41. This photograph [screen on] was also displayed during Mr. Ugalde's speech on Wednesday. And it was included in Costa Rica's judges' folder at tab 100 — you will find it not only on the screen, but it is the first page at tab 5 of our folder this morning. This photograph was said on Wednesday to depict "the massive dumping of sediment at one location, for example, no barriers were erected at all as you can see"[34]. In the transcript, a footnote follows this statement. [Screen on] It reads: "Photograph of sediment deposit near delta. 14 January 2015 . . ."[35] Two sentences after this statement, Mr. Ugalde said: "Nicaragua's dredging has run out of control, involving the dumping of sediment, including in Costa Rica's territory."[36]

42. Mr. President, Members of the Court, I ask you, what does this photograph, coupled with Mr. Ugalde's statements, suggest to you? The answer is obvious, it suggests that this is a pile of dredging sediment that Nicaragua dumped in Costa Rican territory. But it again turns out that this is nothing more than another suggestive waggle of the eyebrows. The location is plainly near the delta, as Mr. Ugalde said, but it is on *Nicaragua's* side of the river. That he did *not* tell you.

43. In regard to the locations where Nicaragua has deposited its dredged sediment, here is what UNITAR/UNOSAT reported in November 2011: they are "located exclusively on Nicaraguan territory"[37] and "[t]here were no visible indications that this depositional activity has been occurring on or otherwise adversely impacting vegetation on the south bank of the San Juan

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[34]59.19.

[35]Fn. 102.

[36]59-60.20.

[37]UNITAR/UNOSAT, "Morphological and Environmental Change Assessment: San Juan River Area (including Isla Portillos and Calero), Costa Rica", 8 Nov. 2011, MCR, Ann. 150, p. 160.

within Costa Rican territory"[38]. UNITAR/UNOSAT further reported that: "there are no visible indications at present that the dredging activity along this section of the San Juan River has had a significant environmental or hydrological impact along the Costa Rican side of the border"[39].

44. To be precise, all of the sites but one were unquestionably on Nicaraguan territory. One of the sites was in the disputed area, on the left or north bank of the *caño* that Nicaragua claims as the boundary between the two Parties. In regard to that site, Professor Thorne wrote that "the impacts were of local extent and time-limited duration" due to the "recovery and regrowth of riparian vegetation"[40]. In other words: no harm. This is demonstrated by the photographs and satellite imagery presented in Professor Kondolf's summary report of 16 March. [Screen on] These two photographs — which you now see and which are the first page at our tab 6 today — appeared in Professor Thorne's first report, they were taken in October 2010 and July 2011, as you can see, and show that the sediment disposal site had largely been covered by vegetation shortly after its formation. The satellite image, from September 2014, which is now before you and which is also at tab 6 of our folder today, shows that now — more than three years after the latest photograph in Dr. Thorne's report — that, as of September 2014, the site has now fully recovered and is completely covered by vegetation. It is now indistinguishable from the surrounding area. As pointed out by Professor Kondolf: "The small pile of sediment seen in Figure 1 [that was the earlier photograph] had become partially re-vegetated a few months later [that is the July 2011 photograph] . . . It has since re-vegetated entirely, as seen in [this] Figure 3."[41]

45. The inevitable conclusion is this. Costa Rica has failed to show that Nicaragua's dredging programme has caused it harm, or that the programme is likely to cause Costa Rica harm, of any kind. The evidence conclusively disproves all of Costa Rica's allegations.

46. Mr. President, Members of the Court, this ends my presentation on the evidence regarding dredging. In just a few moments, Nicaragua will tender its experts for examination by Costa Rica and the Court. Before doing so, I will take two minutes to introduce them to you.

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[38]UNITAR/UNOSAT, "Morphological and Environmental Change Assessment: San Juan River Area (including Isla Portillos and Calero), Costa Rica", 8 Nov. 2011, MCR, Ann. 150, p. 162.

[39]UNITAR/UNOSAT, "Morphological and Environmental Change Assessment: San Juan River Area (including Isla Portillos and Calero), Costa Rica", 8 Nov. 2011, MCR, Ann. 150, p. 162.

[40]Thorne October 2011 Report, p. I-61.

[41]Kondolf Summary Report for *Certain Activities* case, 16 March 2015, para. 11.

Nicaragua's first expert is Professor Cornelis van Rhee, who is Professor of Dredging Engineering at Delft University of Technology. He holds a Ph.D. in Dredging Engineering and Computational Fluid Dynamics, among other degrees, and has been engaged in research for the dredging industry since 1984, and published on a wide range of issues related to dredging.

47. Nicaragua's second expert is Professor Mathias Kondolf, Professor of Environmental Planning at the University of California, Berkeley, who holds a Ph.D. in Geography and Environmental Engineering, as well as other degrees. His areas of research focus on fluvial geomorphology and human-river interactions, with emphasis on sediment management and river restoration. He co-edited the reference work: *Tools in Fluvial Geomorphology*. He has served on the Environmental Advisory Board of the US Army Corps of Engineers.

48. Mr. President, Members of the Court, I thank you for your kind courtesy and patient attention. It has been a privilege for me to appear before you. We are prepared to tender our experts at your command.

Le PRESIDENT : Merci, Monsieur Reichler. La Cour va à présent se retirer pour une pause de 15 minutes après laquelle il sera procédé à l'audition des experts cités par le Nicaragua. L'audience est suspendue.

L'audience est suspendue de 10 h 50 à 11 h 5.

Le PRESIDENT : Veuillez vous asseoir. L'audience est reprise. La Cour va procéder maintenant à l'audition des deux experts cités par le Nicaragua. La procédure suivie pour l'audition de ces experts sera identique à celle qui a été suivie pour l'audition de l'expert cité par le Costa Rica.

La Cour entendra ce matin M. Cornelis van Rhee et M. Mathias Kondolf. M. van Rhee, vous pouvez prendre place à la barre.

Bonjour, Monsieur. Je vous invite à faire la déclaration solennelle prévue pour les experts dont l'énoncé figure à l'alinéa *b)* de l'article 64 du Règlement de la Cour.

Mr. van RHEE:

> "I solemnly declare upon my honour and conscience that I will speak the truth, the whole truth and nothing but the truth, and that my statement will be in accordance with my sincere belief."

Le PRESIDENT : Merci, Monsieur van Rhee. Je m'adresse maintenant au conseil du Nicaragua, M. Reichler, qui va vous demander de confirmer l'exposé écrit qui se trouve devant vous. Monsieur Reichler.

Mr. REICHLER: Merci, Monsieur le président. Good morning, Professor van Rhee. May I please ask you whether you would confirm that the three documents in front of you, that is, your summary prepared for purposes of this hearing and your two reports prepared in the context of this case, reflect your honest expert views.

Mr. van RHEE: Yes, they do.

Mr. REICHLER: Thank you very much. I introduce you to my good friend Mr. Wordsworth.

Mr. WORDSWORTH: Thank you very much.

Professor van Rhee, good morning. You referred at various points in your 2012 report and in your summary to Nicaragua's dredging programme and, as I understand it, there was an initial programme put in train~~ing~~ as a result of the 2008 ***MARENA*** Resolution to which you refer at footnote 4 of your summary, and you also refer to what in effect amounts to a revised programme in what you call the 2011 EPN Annual Report. That is correct, isn't it?

Mr. van RHEE: Can you please point to me where it is?

Mr. WORDSWORTH: That is at footnote 9 of your summary — you refer to the EPN 2011 Annual Report. Do you see the EPN Dredging Project Technical Evaluation Analysis improving Navigation on the San Juan River.

Mr. van RHEE: Yes.

Mr. WORDSWORTH: At paragraph 9 of your summary, you are referring to the programme set out in the 2011 EPN Annual Report when you say that EPN estimated in 2011 that it needed to dredge approximately 95,000 cubic metres of sediment in the 5 km also immediately downstream of the delta.

Mr. van RHEE: That is right.

Mr. WORDSWORTH: As I understand it, that was a total figure from the 2011 EPN Annual Report?

Mr. van RHEE: That was the figure for the initial, or what we call capital, dredging.

Mr. WORDSWORTH: Yes, an initial total figure. They anticipated that they would be dredging 95,000 cubic metres.

Mr. van RHEE: For the initial dredging.

Mr. WORDSWORTH: For the *initial* dredging?

Mr. van RHEE: Yes, in dredging we always distinguish between the initial capital dredging and maintenance dredging.

Mr. WORDSWORTH: Right. If you turn to the judges' folder in front of you, and if I ask you to go to tab 1, page 10, of that document. Do you see there — I think this is what you are referring to — it says "Revised Project Scope"? There it refers to the updated programme and, in particular, you will see that it sets out the quantities of sediment to be dredged from various parts of the river and at *(e)* it says "Reyes — El Delta, dredging volume: 93,735.71 m^3".

Mr. van RHEE: Yes.

Mr. WORDSWORTH: At least there it doesn't say "initial", does it?

Mr. van RHEE: No, but the whole scope of the project was the design, so from the project design follows the capital dredging volumes.

Mr. WORDSWORTH: Well, in any event, wh***en*** we see what happens and, as you state in paragraph 9 of your report, rather than just dredging the 95,000 cubic metres, in fact, in 2011, they dredged over 130,000 cubic metres.

Mr. van RHEE: That is correct.

Mr. WORDSWORTH: And then that upward trend continued in 2012-2014, and you have set out the figures helpfully in paragraph 9 of your report, so that we know that in fact, in this area around the delta, the actual dredging volumes have been much higher than 95,000 cubic metres.

Mr. van RHEE: That is correct.

Mr. WORDSWORTH: In fact, over the period 2012 to 2014 some 600,000 cubic metres was dredged.

Mr. van RHEE: That is right; it follows from the reports.

Mr. WORDSWORTH: To be clear, where you are referring to the delta, you mean the bifurcation between the Lower Río San Juan and the Colorado River: you are not referring to the delta of the Lower Río San Juan when it meets the sea.

Mr. van RHEE: That is true; that's the first stretch.

Mr. WORDSWORTH: Am I correct in thinking that there has been no new environmental impact statement despite the substantial increase in volumes that have been dredged from this stretch of the river**?**

Mr. van RHEE: I have not seen any new environmental impact statement, indeed.

Mr. WORDSWORTH: Right. That's very fair; you have not seen one. And you refer, in your summary, to a Ramsar Advisory Mission Report 69 of December 2010 which focused on the impacts of Nicaragua's excavation of the *caño* in 2010; that is correct, isn't it?

Now, are you aware that in April 2011 a rather more relevant advisory mission report — at least so far as concerns dredging — was sent to Nicaragua by Ramsar for comment; are you aware of that report?

Mr. van RHEE: I don't know the report or the contents of it.

Mr. WORDSWORTH: You are not aware of it?

Mr. van RHEE: No.

Mr. WORDSWORTH: Well, let me just ask you some questions by way of general proposition. The Ramsar report said in its conclusion: "any changes to the pattern of the fluvial dynamics of the San Juan River due to anthropic processes: channelling, dredging, diversion of waters, damming, will alter its flow as well as the dynamics of the associated wetlands and the distribution and abundance of the species living there. Therefore, it is important to perform studies of the relevant environmental impacts prior to its implementation." Now, just as a matter of general proposition, would you agree with that?

Mr. van RHEE: I do, and as far as I know, there was an environmental impact study done and in this impact study also diversion of flow was investigated.

Mr. WORDSWORTH: Now, the environmental impact study which I think you are referring to was done in 2006, and the question is whe***ther*** there has been any environmental impact study, such as referred to here, in relation to the actual dredging that has taken place, which you have helpfully identified, is rather different to what was envisaged in 2006.

Mr. van RHEE: The actual dredging is different in the fact that there is additional maintenance dredging needed to keep these channels open. But the actual flow going through the Lower San Juan is not influenced by this extra dredging.

Mr. WORDSWORTH: Well . . .

Mr. van RHEE: In the way that, for instance, that there will be much more.

Mr. WORDSWORTH: That is a question of flow, which I will come back to in a moment. But surely there is a very significant difference between taking out of a river 95,000 cubic metres, as planned in 2011, and taking out of the river over the course of 2011-2014 730,000 cubic metres and that gives rise to a potential different environmental impact.

Mr. van RHEE: Of course, there is a difference between 95,000 or 600,000 but the issue is "how does it affect the flow of distribution?". Is, for instance, this extra volume dredged, is a wider channel dredged, which is not the case?

Mr. WORDSWORTH: Well, you say it is not the case but the question is, what is the evidence to tell us what the impacts in terms of the flow have been, what the impacts in terms of the actual channel dredged has been. If I can take you further on in this 2011 Ramsar Report. Ramsar recommended, indeed, stated that it was essential to analyse the historic and current hydrological characteristics considering the behaviour of the volumes of flow and the bed load in the area of influence, specifically regarding the variations in the hydrometric level of the San Juan River in representative segments along the main course. And likewise, it said it was essential to analyse the hydrodynamic characteristics of the San Juan River as regards to expected changes in the circulation of the water due to increase of the bathymetric section meander cut-off. Now so far as you are aware, have those exercises been carried out so far as concerns the actual programme of dredging as it ***has been*** carried through over the past three to four years?

Mr. van RHEE: As far as I know, the effect of the dredging on the bifurcation is done. I do not know, I am not aware of specific effects of this cut-off of the meander.

Mr. WORDSWORTH: But, so far as you are aware, these relevant analyses have been carried out***?***

Mr. van RHEE: Yes, analysis has been carried out on the change of the river profile and then the according difference in flow distribution. It was done in the EPN study of 2006 and . . .

Mr. WORDSWORTH: That is 2006, what I am asking you about is what has happened in relation to the actual dredging that has taken place between 2011 and 2014.

Mr. van RHEE: Yes, in regard to what, the volume?

Mr. WORDSWORTH: Yes. Do you know if those analyses that Ramsar is recommending as essential, do you know whether those have been carried out?

Mr. van RHEE: Not that I know.

Mr. WORDSWORTH: Now, you make reference in your 2012 Report to certain flow rates, flow rate measurements that were taken by Nicaragua in 2006, 2011 and 2012 and they are in the INETER Report and that, in fact, is the document note that Mr. Reichler has just put up on the screen. You will recall it, it is in the judges' folder and somebody will help me tell you which tab it is. It is tab 4 of Mr. Reichler's judges' folder, if you want to — it is not in that document, it is not in that judges' folder, it is tab 4 of Mr. Reichler's judges' folder.

Now, I am right in thinking, am I not, that what this shows is flow rates measurements — and I believe also suspended sediment flow measurements — just on three individual dates? That is correct is it not? So, one of the dates is 1 August 2006, one of the dates is 24 January 2011 and one of the dates is 26 April 2012. So, three measurements spanning a period of six years.

Now it would, of course, have been possible for Nicaragua to take regular measurements of flow above and below the delta, just as was in fact done for those three individual dates. There would have been no difficulty so far as concerns Nicaragua taking those flow rate measurements? That is correct, is it not?

Mr. van RHEE: Yes, that is possible.

Mr. WORDSWORTH: Well, is it correct or is it not?

Mr. van RHEE: Well, it is correct. Sorry, can you maybe repeat the question?

Mr. WORDSWORTH: Yes. It would, of course, have been possible for Nicaragua to take regular flow rate measurements?

Mr. van RHEE: That is possible, that is correct, yes.

Mr. WORDSWORTH: And such regular measurements would have provided an essential basis on which to verify whether or not Nicaragua's current increased dredging at the delta is or is not causing any impact on the flow of water to the Colorado River. That is correct, is it not?

Mr. van RHEE: Yes but as far as we have seen now, studies have been done; initial studies have been done by your expert; studies have been done by myself, together with a colleague of mine, Professor de Vriend and in these studies we have looked at and already in 2011, the distribution of flow and the influence of dredging on distribution, and we already predicted then that the extra flow into the Río San Juan would be quite low, only a few per cent, and what I see from these measurements is that they, in fact, convince us that these computations were right.

Mr. WORDSWORTH: Now, I understand what you are saying about the report you did in 2011. What I am interested in is what is actually happening by reference to the actual dredging that is going on and exploring whether flow rate measurements could actually tell the Court what is happening. And, of course, they could if they were taken. They would tell the Court exactly what is happening in terms of how much water is going down the Lower San Juan and how much is going into the Colorado. That is correct, is it not?

Mr. van RHEE: That is correct, yes.

Mr. WORDSWORTH: And I notice from the Ramsar 2011 Report, which regrettably you have not been shown, there the Ramsar team says

> "Considering the nature of the project and the area of influence, we suggest incorporating the following variables into the Environmental Control and Supervision Programme to be implemented by the EPN during the project and a hydrological cycle afterwards, as well as the corresponding monitoring by MARENA."

And then it sets out what it is recommending:

> "Monthly monitoring of the hydrometric levels between the delta and the mouth of the San Juan River, in representative sections along its main course, at least during the construction phase of the project.
>
> Monthly monitoring of the concentration of suspended solids in ***the*** water column in representative sections along the main course of the river."

That monthly monitoring, so far as you are aware, has not been done?

Mr. van RHEE: I do not know, I only know these figures, but I think that more is always better, of course. The question is, the information that we have got now upon which I have concluded or upon which we looked at the results, I think that ~~***the matrix is***~~ the information that is provided during this project ***is*** sufficient to form an opinion on what is happening in this river at this bifurcation point. I am of the opinion, as an expert, that it is sufficient for me to state that these dredging works have only a very limited influence on the flow distribution, which is also acknowledged by your expert~~***s***~~.

Mr. WORDSWORTH: Well, it depends, of course, on what is actually being done, what is actually being dredged. But it is correct, is it not, that you in your report, you rely on the three separate INETER measurements that were taken over this six-year period and seek to draw conclusions from those. That is correct, is it not?

Mr. van RHEE: Well, in fact in my first report I only had the measurements before that time and already then we estimated the effect; that was then confirmed by the later measurements.

Mr. WORDSWORTH: By the later measurements, you say three measurements over a six-year period, three individual measurements. And of course, monthly monitoring would tell you a very great deal more in terms of what is actually happening, in terms of flow rates.

Mr. van RHEE: I cannot deny that.

Le PRESIDENT : Monsieur Wordsworth, la durée de 20 minutes dont vous disposiez pour ce contre-interrogatoire arrive à échéance dans une minute. Vous pouvez encore poser une question avec une réponse brève. Mais vous pouvez y renoncer aussi.

Mr. WORDSWORTH: So, perhaps I can just ask you, that you would accept that in actual fact you can tell little or nothing definitive from three individual measurements that are carried out over a period of six years, at different times of the year . . .

Mr. van RHEE: Sorry, I missed the first part of the question.

Mr. WORDSWORTH: You would accept that you can actually tell very little definitive from the three individual measurements carried out over a six-year period at different times of the year, and that is all that we have on the record.

Mr. van RHEE: I do not accept that.

Mr. WORDSWORTH: You do not accept that?

Mr. van RHEE: No.

Mr. WORDSWORTH: You think that those three measurements are sufficient to draw expert conclusions?

Mr. van RHEE: Yes, together with all the other reports, all the other evidence, all the other reports of other experts — that is, for me, sufficient.

Mr. WORDSWORTH: And those measurements, the last of which was taken on 26 April 2012, that enables you to tell what is happening as of today in April 2015?

Mr. van RHEE: Not only that measurement. The total picture you have to look at as an expert, you cannot just look at one individual measurement.

Mr. WORDSWORTH: Thank you. I think I have probably strayed over my minute. Thank you very much.

Le PRESIDENT : Merci, Monsieur Wordsworth. Je me tourne maintenant vers M. Reichler, le conseil pour le Nicaragua. Souhaitez-vous procéder à un interrogatoire complémentaire ? Si c'est le cas, vous disposez d'une durée maximale de 20 minutes.

Mr. REICHLER: Thank you very much, Mr. President. I will try to be briefer than that. Professor van Rhee, you said that there is a difference between capital dredging and maintenance dredging. Could you explain that, please?

Mr. van RHEE: Capital dredging, or initial dredging, is dredging that is needed to make, for instance, a channel from the existing situation where we have just a flat riverbed and there we dredge a channel with a certain dimension. But after we have dredged that channel, you are not finished yet because nature tries to fill up the channel again. Nature tries to restore the original situation of the river bed. That is what we call "sedimentation" and you have to re-dredge — that is also mentioned in the report several times — re-dredge and re-dredge to keep this channel open, especially in a river with a movable bed. That is normal, in fact, for all rivers where you dredge.

Mr. REICHLER: Thank you, Sir. Does that account for the difference in the dredging amount which you identified as the 93,000 that is "capital dredging", and then the higher amount that Mr. Wordsworth asked you about: is the difference in those amounts the difference between the capital dredging and the maintenance dredging?

Mr. van RHEE: Yes.

Mr. REICHLER: So, that additional amount that was dredged was really just to keep the same channel open without expanding the channel at all, that was envisioned by the project?

Mr. van RHEE: Yes.

Mr. REICHLER: And, I think you said that the maintenance dredging, this additional dredging for maintenance purposes or re-dredging, had no impact on the flow as compared to the capital dredging?

Mr. van RHEE: That is correct because you need this maintenance dredging to keep the channel that you have created open, and the flow calculations are based on this profile.

Mr. REICHLER: And so, the re-dredging, or maintenance dredging, does not change the flow profile or the flow rate?

Mr. van RHEE: No.

Mr. REICHLER: So, if the flow rates and flow levels do not change as a result of the maintenance dredging, is it correct to say that the impacts downstream, where the dredging is done, would be unchanged?

Mr. van RHEE: That is correct.

Mr. REICHLER: So, the impacts downstream — including in the protected wetlands downstream from the dredging project — would be no different as a result of the new dredging or maintenance dredging than they would be for the capital dredging?

Mr. van RHEE: If you would not re-dredge, then in fact you could end up in the situation where the whole river will dry up, so then you will have negative consequence.

Mr. REICHLER: And what is the long-term impact, the long-term effect, of the flow rates in the . . .

Le PRESIDENT : Pardon, je vous interromps une seconde. M. Wordsworth demande la parole. Je la lui donne.

Mr. WORDSWORTH: With respect, Mr. President, Mr. Reichler, I know that the Court is obviously not that familiar with cross-examination and re-examination, but Costa Rica would submit that in order to assist the Court, re-examination should be by way of *opening* questions as opposed to *leading* questions that asks, in effect, the expert to say "I have just said something, will you please agree with that?". It is not a very helpful way, we would submit, of getting the Court, the expert, evidence that will assist it in its deliberations.

Le PRESIDENT : Merci, Monsieur Wordsworth. Certainement une question doit être aussi sincère que possible et laisser à la personne interrogée le soin de donner la bonne réponse. Et je suis sûr que M. Reichler tient compte de cette observation. Vous avez la parole pour poursuivre, Monsieur Reichler.

Mr. REICHLER: You are correct, Mr. President, and I thank you very much. Do you have an opinion on what is the long-term trend in terms of the flow rates for the Lower San Juan River and the Colorado River, given the natural processes?

Mr. van RHEE: When you look at the long timescale, that is more when you look back a couple of centuries, you will see that gradually the flow distribution is changing, so less water is going to the San Juan and more to the Colorado.

Mr. REICHLER: Do you expect that trend to continue?

Mr. van RHEE: I think so, yes.

Mr. REICHLER: Would Nicaragua's dredging of the Lower San Juan have an impact, or an effect, on what you have just described as the long-term trend?

Mr. van RHEE: Well, it can delay this trend, depending on the volume of dredging and if you are able to keep up with this extra sedimentation.

Mr. REICHLER: Do you foresee that Nicaragua's current dredging programme has the capacity to reverse this trend that you described as distributing increasing flows to the Colorado and less flows to the San Juan?

Mr. van RHEE: I doubt it because you see that currently the amount of dredgers available on site are more or less concentrated on the first section of the San Juan River, where more sedimentation takes place. And I think they have a difficult job to really dredge all the sedimentation in this section alone. So, when you really want to reverse the situation, you really need a totally other dredging programme, of a different magnitude.

Mr. REICHLER: Do you therefore think — to be perfectly . . . neutral — so that with the present Nicaraguan dredging programme, as it is, do you foresee, what do you foresee, over the medium term/long term, in terms of the distribution of flow of the San Juan River between the Colorado River and the San Juan River?

Mr. van RHEE: I think that with the current volume of dredging, maybe they can maintain the current flow distribution, but maybe it is even not enough, at the moment, so that gradually the flow will decrease in the river.

Mr. REICHLER: Gradually decrease, in which river?

Mr. van RHEE: In the San Juan River.

Mr. REICHLER: And does that mean it will increase somewhere else?

Mr. van RHEE: Yes, at the end, but then we are talking over a long, very long, much longer time period, maybe 100 years, I do not know: I have not looked into that in detail but at the end, it can affect the total flow in the San Juan — that it really will silt up and all the flow will then go the Colorado.

Mr. REICHLER: I have no further questions.

Le PRESIDENT : Merci. Merci, Monsieur Reichler. Je vais maintenant donner la parole à Monsieur le juge Gaja qui souhaite poser une question à l'expert. Monsieur le juge Gaja, vous avez la parole et je demanderai à Monsieur van Rhee de répondre à la question aussi tôt après qu'elle aura été posée. Monsieur Gaja.

Judge GAJA: Thank you, Mr. President. Professor van Rhee, page 9 of your summary report, referring to the 2015 summary report, you observed that the first *caño*, the 2010 *caño*, "is now entirely closed". This less than four years after the clearing operation was completed. My question is whether this phenomenon is consistent with the existence, before 2010, and possibly for a long period, of a navigable channel following the same track as the first *caño*? Thank you.

Mr. van RHEE: I find it difficult to answer that question. This observation relates to the recent situation, where the channel was cleaned to a certain width and, as a result of that, flow started to go through this *caño*, but this flow rate — at the current morphological situation of the river: the sediment load, etc. — was not strong enough to keep this channel open. It does not say

that ***before*** 100 years the same behaviour would also ***have been*** observed. So this conclusion is related to the current situation. I hope that answers your question.

Le PRESIDENT : Monsieur le juge Gaja, vous en avez terminé ? Merci, Monsieur van Rhee. Ainsi s'achève votre déposition. Nous tenons à vous remercier d'avoir bien voulu comparaître devant la Cour. Vous pouvez à présent quitter la barre. Merci.

Mr. van RHEE: Thank you for your attention. It was a great pleasure to be standing here before you.

Le PRESIDENT : La Cour entendra maintenant Monsieur Kondolf que j'invite à prendre place à la barre.

Bonjour, Monsieur Kondolf.

Mr. KONDOLF: Good morning. It is a pleasure to be here.

Le PRESIDENT : Je vous prie de bien vouloir faire la déclaration solennelle prévue pour les experts et qui figure à l'alinéa *b)* de l'article 64 du Règlement de la Cour. Je vous donne la parole.

Mr. KONDOLF: I solemnly declare upon my honour and conscience that I will speak the truth, the whole truth and nothing but the truth and that my statement will be in accordance with my sincere belief.

Le PRESIDENT : Merci, Monsieur Kondolf. Je m'adresse maintenant au conseil du Nicaragua qui va vous demander de confirmer l'exposé écrit qui se trouve devant vous. Monsieur Reichler.

Mr. REICHLER: Thank you, Mr. President. Good morning, Dr. Kondolf. May I ask you to confirm whether the three documents in front of you — that is, your summary prepared for the purposes of this hearing and your two reports prepared in the context of this case — reflect your honest expert views.

Mr. KONDOLF: Yes, they do.

Mr. REICHLER: Thank you very much; and I introduce you to my good friend, Mr. Wordsworth.

Mr. KONDOLF: Good morning.

Mr. WORDSWORTH: Good morning, Dr. Kondolf. Can I ask you to go to paragraph 19 of your summary that you have in front of you and you will see there, there is a section that begins "E. The Existence of the Caño".

Mr. KONDOLF: Yes.

Mr. WORDSWORTH: And in essentially the remainder of this summary report, you focus on the issue whether there are, or have been, any distributaries flowing from the Río San Juan into *any* part of the Harbor Head Lagoon, and of course you point to certain areas of disagreement that you have with Professor Thorne. Correct?

Mr. KONDOLF: That is correct.

Mr. WORDSWORTH: What I want to explore with you is *your* expert view as to whether the *caño* that Nicaragua says was cleared in 2010 existed in the period prior to 2010. And from this summary I am finding it difficult to pin down exactly what your expert view is. So, given the importance of this issue to Nicaragua's defence in this case, am I right in taking it that it *is* your expert view that this *caño* did indeed exist prior to 2010?

Mr. KONDOLF: It is my expert view that it is very likely that it existed: there is evidence that it existed but I think one would need to go in the field and confirm. Well, obviously things have been somewhat modified, but in general that is a good approach but it appears on some maps: there is a certainly some evidence that such a *caño* existed.

Mr. WORDSWORTH: So, your evidence is that it is very likely that it existed?

Mr. KONDOLF: Yes.

Mr. WORDSWORTH: Very good. Well, let me explore that by reference to the various maps and images that you refer to in your summary and in your 2012 report. In your 2012 report, you are really focusing on two 1961 images and the 1949 map that the Court has become familiar with. At pages 13 to 14 of your 2012 report, you refer to these two 1961 aerial images, and you rely on these as depicting the *caño*, and in fact Professor Pellet put at least one of these images up on the screen yesterday, and I hope it is going to come up on the screen right now.

So, this is the first of the two images, and we can see what you say, you say that it shows the lower half of the *caño* very clearly. Now, I just want to break this down a little. As I understood Mr. Reichler's questions on Tuesday, this photograph formed the basis of the 1988 United States defense mapping agency map. Is that correct?

Mr. KONDOLF: I would need to look again at that legend, but as I recall, the legend for that map indicated that it was based on this aerial photograph with a more recent photograph as well from 1987 — or imagery.

Mr. WORDSWORTH: Well, we will check that point on the 1987 [map], but on the 1961 map we are obviously in agreement. That is helpful for your reference to 1987 also. You are obviously familiar with that 1988 United States defense map?

Mr. KONDOLF: Yes, I have looked at it, Sir.

Mr. WORDSWORTH: It was on the screen yesterday. And it was actually annexed to Costa Rica's Memorial. So I presume it was one of the maps that you reviewed when you were putting together your 2012 report? Is that correct?

Mr. KONDOLF: I assume I did look at that one, I do not recall specifically at that time, but presumably yes.

Mr. WORDSWORTH: So, if we put the 1988 map up on the screen, you will agree that that does not show a *caño* where Nicaragua cleared, or excavated, the *caño* in 2010, does it?

Mr. KONDOLF: Yes, what this map shows — or what our map does — [is] a perennial *caño* which has been referred to as the Y *caño* to the north; along the course of the *caño* at the southern tip of Harbor Head Lagoon, it does not show such a perennial channel.

Mr. WORDSWORTH: Exactly, and ***for the*** purpose of this case, I know Nicaragua is trying to focus on this Y channel, but actually the *caño* it constructed, or excavated, or cleared, in 2010 does not follow that route, does it?

Mr. KONDOLF: That is correct.

Mr. WORDSWORTH: And, we can suppose that whoever prepared this map, at a number of photographs — I think you have referred to the [19]61 photograph and you have just referred to a 1987 photograph — was an expert in cartography: whoever prepared this map was an expert in cartography?

Mr. KONDOLF: Presumably, yes.

Mr. WORDSWORTH: And would presumably be an expert in drawing up maps from aerial imagery?

Mr. KONDOLF: Yes, presumably so.

Mr. WORDSWORTH: And when it comes to *your* expertise, you are *not* an expert in cartography are you?

Mr. KONDOLF: No, I have a doctorate in geography, so of course we are working with maps all the time, but no, I am not a "cartographer" per se.

Mr. WORDSWORTH: And, you are not, likewise, an expert in drawing up maps from aerial imagery?

Mr. KONDOLF: No. Not these kind of maps.

Mr. WORDSWORTH: And, the second 1961 image that you refer to in your 2012 report — [it] is now up on the screen — and you say that this shows the *caño* that you are referring to, the 2010 *caño*, extending the entire distance from the Río San Juan to Harbor Head Lagoon — that is what you say — and there we see it on the screen. Now, just as a preliminary matter, is it not unusual to rely on a lower-resolution, smaller-scale image to see a feature which cannot be seen on the larger-scale image of the same terrain?

Mr. KONDOLF: As a general rule, one would rely more on the larger-scale image; however, every aerial image is taken under different lighting conditions, with a different sun angle, so there can be different cameras, different airplane elevations. There are a lot of factors that could influence whether a feature is visible on one aerial photograph, versus another.

Mr. WORDSWORTH: OK, well, I see that as a general response. But you cannot in fact see the *caño* that Nicaragua supposedly cleaned in 2010 on that photo, can you?

Mr. KONDOLF: Well, I see a lineation going from the southern tip of Harbor Head Lagoon to the Río San Juan. I think most people could probably see that.

Mr. WORDSWORTH: So that is what you are saying is the 2010 *caño*? Is that right? Going from that delineation from, essentially the southern tip, directly down to the Río San Juan?

Mr. KONDOLF: Well, we see a lineation that is in roughly the same area. So, it may be that *caño*.

Mr. WORDSWORTH: But you surely agree, that the same feature is shown in the 1988 map — if I could have that back up on the screen — and that is marked in a white marking which I understand is some sort of a sand dune, or the like? And there is nothing whatsoever there, is there, to suggest that there is a *caño*? Is there?

Mr. KONDOLF: No, there is no channel mapped, and I do not know how to interpret that white area, it is rather mysterious.

Mr. WORDSWORTH: Well, I mean, it is in the indications, is it not? And the indications do not for one moment suggest that it is a *caño*, do they?

Mr. KONDOLF: No, I am not suggesting that the white band is indicative of the *caño*. No.

Mr. WORDSWORTH: Right, but if we just go back to your 1961 photo that you refer to in your 2012 report, ***as*** very clearly showing the *caño*; it is simply not there, is it?

Mr. KONDOLF: What is not there?

Mr. WORDSWORTH: The *caño*, the 2010 *caño*.

Mr. KONDOLF: There is a lineation, from the south tip of Harbor Head Lagoon, to the Río San Juan, that maybe, it follows roughly the course of this *caño*, that is in dispute, and that maybe an indication of it.

Mr. WORDSWORTH: Right. In putting together your 2012 report — now that you have looked again at the 1988 map — do you recall whether you *did* have the 1988 map when you were drafting your report, the 2012 report?

Mr. KONDOLF: I could check and see if I refer to it in here.

Mr. WORDSWORTH: Just your recollection.

Mr. KONDOLF: I do not remember at the moment.

Mr. WORDSWORTH: Right, can I ask you then, a few questions about the 1949 map, which is the other image, or map, that you refer to in your 2012 report? And, obviously, a great deal of weight is being placed on this, by Nicaragua. Can I just ask one question on this, is it correct to say that this is a large-scale map of Costa Rica, with the scale of 1:400,000?

Mr. KONDOLF: Reading the legend, it appears to have a scale of 1:400,000 and the term "large-scale" usually refers to — among geographers — usually refers to a more detailed map.

Mr. WORDSWORTH: That is very helpful, so a small-scale?

Mr. KONDOLF: Yes.

Mr. WORDSWORTH: Thank you. And if we look at the maps that are available, that are closest in date to 1949, then it is correct to say that these do *not* show the 2010 *caño*, do they? In any form?

Mr. KONDOLF: Which maps are you referring to?

Mr. WORDSWORTH: The maps that are closest in date are a 1930 map, which is now on screen. And you can see there, there is no sign of the so-called *caño*. It is probably easiest to look at it on the screen.

Mr. KONDOLF: It is a bit ***grainy***, but I do not see a channel going from the Harbor Head Lagoon to Río San Juan at the *caño* location. Yes.

Mr. WORDSWORTH: Thank you. And if we now put on the map closest in date, I think, to the 1949 map: that is the 1931 map that Professor Pellet showed the Court yesterday — do you agree that there is no *caño* shown there?

Mr. KONDOLF: I agree. Yes.

Mr. WORDSWORTH: And there are two — in terms of the period immediately after 1949 — the next maps we come to are two 1:1 million small-scale maps of Nicaragua of 1965 to 1966. They are Annex 122 of Nicaragua's Counter-Memorial and you can take it from me that they show no *caño*, and counsel for Nicaragua will certainly put me right if I am wrong about that.

The next map which shows the area in any detail is the Costa Rican 1970 map which is rather more usefully a scale of 1:50,000. And that also is compiled based on photos taken in 1961 and you will agree that the so-called 2010 *caño* is not featured on that map, is it?

Mr. KONDOLF: No, it does not appear there.

Mr. WORDSWORTH: And Professor Pellet took the Court yesterday to two 1970 maps of Nicaragua which are at ***least*** 1:1.5 million in scale and again Nicaraguan counsel can take you to

those, if they wish, but you can take it from me: those do not show the *caño*. So, the point I am putting to you is that there are no *other* maps or images that you have pointed to that show the 2010 *caño*, other — that is, prior to its construction in 2010 — in your report or in your summary. No other maps, ***no*** other images.

Mr. KONDOLF: I recall that there were some others, but unfortunately I would have to refresh my memory.

Mr. WORDSWORTH: Counsel for Nicaragua will certainly take you to them if there are any. Put simply, if I am correct that that is the totality of the evidence that you are relying on — and ***it may be*** that in your report you refer to maps prior to 1897 but I am not taking those as being relevant, legally relevant, for the purposes of this hearing: so, other than what can or cannot be deduced from the 1949 map, there is no evidence at all that the *caño* as excavated by Nicaragua in 2010 had any prior existence, is there?

Mr. KONDOLF: No, we see some evidence on the 1961 photos. We see some kind of pattern, some kind of lineation that is suggestive. I have to review again the various images to see: as I recall there are a number of places where you can see that there is, at the south end of Harbor Head Lagoon, the lines on some of the old maps are shown as open. So there are certainly some suggestions that there is.

Mr. WORDSWORTH: Do any of these other maps, documents, images, whatever . . . do they follow the course of the *caño*, as actually constructed by Nicaragua in 2010, in your view?

Mr. KONDOLF: What you see in the 1961 photographs, that follows at least the portion that goes from the south part of Harbor Head Lagoon towards the river. And then there is the part of the *caño* that continued parallel to the river, which is not as clear.

Mr. WORDSWORTH: Thank you. So it comes down to the 1961 image, in terms of a *caño* that follows the course of the 2010 *caño*.

Mr. KONDOLF: Again, I would need to review all these but certainly it seems that the 1961 is the most suggestive that we have discussed, I think.

Mr. WORDSWORTH: Thank you. And just for the sake of clarity, what I have done is taken you to Section 2.6 of your 2012 Report, where the maps and images that you refer to are the 194***9*** map and the two 1961 images.

Mr. President, am I running out of time?

At paragraphs 25 to 26 of your summary, you refer to a Ramsar Report of 2014, and if I can just take you to paragraph 25, you say: "Finally, the existence of *caños* [plural] connecting the Río San Juan to Harbor Head Lagoon is supported by Ramsar." Then you refer to a site visit of 10 to 13 March 2014. Am I correct in thinking that that site visit concerned the *caños* that were constructed by Nicaragua in the summer of 2013? Is that correct? Which are further to the west of the *caño* constructed in 2010.

Mr. KONDOLF: I believe that is the case, yes.

Mr. WORDSWORTH: Now, if I can take you to the last two bullet points here, which appear to be the ones you are relying on, you quote: "In and around the area walked and flown over of the CE [which I presume is *Caño Este*], we observed at least four natural *caños*, most with convergent flow in the direction of the *Caño Este* lagoon; one of them toward Laguna Portillos [i.e., Harbor Head Lagoon]." So that is just one out of those four *caños* that could support the statement that you've made in paragraph 25 of your summary. Is that right?

Mr. KONDOLF: That is correct.

Mr. WORDSWORTH: So it should read: "Finally, the existence of a *caño* [singular] connecting the Río San Juan to Harbor Head Lagoon is supported by Ramsar."

Mr. KONDOLF: Yes. I stand corrected. That is correct.

Mr. WORDSWORTH: And, just so as I understand it, you are not suggesting that that *caño* has anything to do with the *caño* that was excavated by Nicaragua in 2010, are you?

Mr. KONDOLF: I do not believe the Ramsar Report is specific about where the *caños* they observed, where they occurred.

Mr. WORDSWORTH: You think it may be referring to the 2010 *caño*?

Mr. KONDOLF: I do not know that it is for me to read into their report.

Mr. WORDSWORTH: Is it not? Because if I ask you to turn to page 6 of your report, there you have got a 26 September 2014 of the *caño* excavated in 201***0***.

Mr. KONDOLF: Yes. Good point. Ok.

Mr. WORDSWORTH: Yes ***at*** 2014, it is absolutely crystal clear.

Mr. KONDOLF: You are right. They cannot be talking about that one. They have to be talking about another one.

Le PRESIDENT : Merci Monsieur Wordsworth. Les vingt minutes qui vous étaient allouées sont à présent expirées. Je vous remercie. Je me tourne vers le conseil du Nicaragua. Monsieur Reichler, souhaitez-vous procéder à présent à un interrogatoire complémentaire ? Si c'est le cas, je vous donne la parole.

Mr. REICHLER: We are perfectly content with the answers given, Mr. President. We have no need for re-examination.

Le PRESIDENT : Merci, Monsieur Reichler.

Monsieur Kondolf, certains juges voudraient vous poser des questions. Je vais donc leur donner la parole successivement et je vous demanderai de répondre à chaque question aussitôt après qu'elle vous aura été posée.

Je donne d'abord la parole à M. le juge Greenwood.

Judge GREENWOOD: Thank you very much, Mr. President. Professor Kondolf, I wonder if you would have another look at the 1949 map? And if one of the teams of counsel could put that up on the screen, it will assist the members of the public. Do you have the close-up of the Isla Portillos?

Mr. KONDOLF: Yes, I am looking at the close-up.

Judge GREENWOOD: Right, thank you. Were you here when Professor Thorne testified earlier this week?

Mr. KONDOLF: Yes.

Judge GREENWOOD: In answer to a question I put to him, he said that he thought this map did not accurately depict the channels in that area and he gave an explanation of why. Do you agree with what he said?

Mr. KONDOLF: Well, this is obviously very interpretative, looking at a small-scale map and as it has been shown. I do not disagree with Professor Thorne. His theory may be correct. I believe he thought that the channel shown from Harbor Head Lagoon to the Río San Juan should actually connect with what as been called the "Y" channel. That is quite plausible also.

Judge GREENWOOD: Yes, and if that were the case, would the 1949 map then be in accordance with the details shown on the, I think it is the 1988, map?

Mr. KONDOLF: Yes, it is closer but I should say it is hard to tell from these maps which is correct but your question is correct, that if Professor Thorne is correct about that channel linking with the "Y" channel, then that would be in accordance with 1988, yes.

Judge GREENWOOD: In the light of the answers you have just given, do you think either of these maps can be relied upon as evidence of where any channel may have been located in 1949 or in 1988?

Mr. KONDOLF: Yes, I think they can be relied on as evidence but we should bear in mind that any map is imperfect, it is done for a certain purpose, but I think it is still valuable evidence for trying to determine the situation.

Judge GREENWOOD: It is just that the two maps contradict each other . . .

Mr. KONDOLF: Yes, unfortunately, yes, but many maps contradict one another, so . . .

Judge GREENWOOD: Right! Thank you very much. You have obviously tried to navigate certain parts of Europe using maps like the ones I have in my car.

Would you have a look at paragraph 17 of your summary statement, please? The last two sentences of that paragraph. You say: "Faster tree growth means the trees are likely not as old as estimated by Costa Rica. It also means that the forested area will regenerate quickly." What is your estimate of how old the trees are?

Mr. KONDOLF: I am not an expert in tropical ecology or forestry, so I do not feel qualified to make an estimate. But I believe in my report I did observe that if the higher rates of tree growth that were recorded for disturbed areas, in other words, where the trees do not have competition from pre-existing trees and access to water and sunlight, that they were growing about twice as fast and, if that were the case, then the age you would compute for some of these trees was, instead of over 200 years, it would be just over 100 years.

Judge GREENWOOD: Right, so how quickly would the forested area regenerate in your view?

Mr. KONDOLF: Well, the trees in question that I refer to are some of the larger trees so it would take decades for those to come back. But smaller trees would probably come back in years. Again, I am not an expert in this field but, from what I have observed in this kind of environment, it is very hot, very wet and lots of nutrients. It is a good place for trees to grow quickly.

Judge GREENWOOD: Thank you, Professor Kondolf. Thank you, President.

Le PRESIDENT : Merci, Monsieur le juge Greenwood. Merci, Monsieur le professeur. Je vais donner maintenant la parole au vice-président Yusuf qui souhaite également vous poser une question.

VICE-PRESIDENT YUSUF: Thank you, Mr. President. Professor Kondolf, if you can turn to paragraph 19 of your summary statement. On page 10, you refer to the report of Professor Thorne where it is stated that "no distributaries linked the Río San Juan to the Harbor Head Lagoon" and you say that this is a "sweeping" opinion. And then you go on and say: "It is far more likely in this deltaic environment that different distributaries connecting the River to Harbor Head came into and then passed out of, existence, in the normal course." Does that mean that, in your view, there are no perennial *caños* in that area?

Mr. KONDOLF: Not necessarily. There could be *caños* that remained perennial and have water flowing all year around. But in the bigger picture, we do expect that these channels will fill up, shift, move around. That is the nature of the delta environment.

VICE-PRESIDENT YUSUF: Thank you.

Le PRESIDENT : Merci. Je donne la parole à Madame la juge Xue.

Judge XUE: Thank you, Mr. President. Professor Kondolf, I have a question for you. In your written statement submitted on 16 March 2015, you state in paragraph 8 of your report: "Keeping the Lower San Juan flowing,. . . dredging of the River . . . mitigates . . .problems [for navigation and existing wetland habitat], maintains water flow, and continues to supply sand to coastal beaches," Then you conclude — I hope you have already found the place? — I quote: "In this context, dredging is a reasonable management activity to maintain the River's navigability and existing environmental conditions." By this conclusion, do I understand correctly, your advice is that dredging activities should be continuously maintained? If so, should the current scale of the dredging operations be maintained as well? And I notice in the previous questions that the experts mentioned about capital dredging and maintenance dredging. Relating to this question, I would like you to further clarify one point in your statement. At paragraph 10 of your written statement,

you refer to the "modest scale of the authorized dredging which is confined to restoring within the existing River a navigation channel 2 m deep, 30 m wide at the upper section, and 20 m wide at the lower section". Could you explain at which section of the river this authorized scale should apply? Does it mean it should apply to the whole entire course, 24 km course of the Lower San Juan River? If so, does it apply to both seasons, rainy season and dry season? And, to maintain that navigability of that channel, especially in the dry season, I assume you have calculated the water flow rate at the delta area? I refer to the delta bifurcation with the River Colorado. So have you calculated that? Thank you.

Mr. KONDOLF: Thank you. I will try to respond, maybe in reverse order since we are talking about this flow split right now. I have not made my own calculations of the flow split and the potential effect of dredging on that flow split. I did not do it myself because Professor van Rhee is an expert in this and he was already coming up with his estimate and Professor Thorne, likewise, did this, so I did not see any need that I would do that myself. I do not disagree with their calculations: they seem quite reasonable. I am familiar in a general sense with the methods they used and it seems reasonable.

You asked also about the dimensions of the navigation channel. And just to be clear about what I understand this means is that the navigation channel would be 2 m deep; at the bottom of the riverbed, it would be 20 m wide and then as you go up, it would flare out to about 30 m. So it has a kind of a trapezoidal form excavated into the shallow-bed that existed before the dredging. I have looked at some of these documents related to the dredging, but I do not recall whether exactly those same dimensions are supposed to be constructed along the entire length of the Lower Río San Juan. I assume that in order for the navigation to be continuous, that they would be, but I would probably need to consult the reports to say that for sure.

You also asked me about the benefit of dredging and whether I would recommend that the dredging continue. Because of the very high rate of sediment accumulation in the delta and, as already has been discussed by Professor Thorne, Professor van Rhee, there is this tendency for the Lower Río San Juan to fill the sediment and more and more the flow will go into the Colorado. And so, in order to preserve the current flow pattern — or at least slow the loss of flow in the

Lower Río San Juan — dredging does appear to me reasonable management activity, a reasonable option.

In terms of, I think your question was about whether I would recommend it be maintained at the current levels. Again, it is not my expertise so much but I would say just in general we could say that maintaining a larger channel — and the idea of the dredging is that you are not digging sediment out of the entire cross section, you are concentrating it in a channel, usually near the middle, and that having that *would* allow more flow to down the Río San Juan. So, that could help to maintain navigability and deliver water to the wetlands downstream.

Judge XUE: Thank you very much, Professor. Actually, my question is: if you maintain the navigation channel, especially at the *end* of the Lower San Juan — with this channel 2 m high — does it have any effect at the delta region? You really have to increase the flow rate to maintain that, especially in the dry season. This is something I could not find in the expert's report. In the Annex 114, attached to the Counter-Memorial, from Nicaragua, I do see that it is really channel bed and just now, Professor van Rhee, explained quite clearly — in other words, when you say 2 m, you mean the metres of the navigation channel? Or you mean actually from the top, the surface of the water, to the bottom of the channel, you maintain 2 m? Because this will affect the water flow. And the river is in the possession of Nicaragua and indeed Costa Rica cannot give me the specific data. So I wonder, when you designed this channel, have you calculated the effect on the water flow to that extent? Thank you.

Mr. KONDOLF: I am sorry, I misunderstood your question. Again, this is not work that I did myself but I believe myself Professor van Rhee did make the calculation that, if you were to create this channel, and my understanding is that the depth would be the depth from the water surface to the bottom of the channel in the dry season — unless it is specified that it is only to be achieved in the wet season. And yes, especially, if that were to be created from the delta all the way to the river mouth, that would make a path for much more efficient flow of water and . . . I do not know if I am still answering your question or not?

Judge XUE: Thank you very much. You have been very clear.

Mr. KONDOLF: Thank you.

Judge XUE: Thank you.

Le PRESIDENT : Merci, Monsieur le professeur. La dernière question — car je crois que ce sera la dernière — va vous être posée par Monsieur le juge Robinson, auquel je donne la parole.

Judge ROBINSON: Professor, may I invite you to look at paragraph 19 of your report where you make the point that the river has a higher water surface than the lagoon and also that there is a slope between the river and the lagoon. And this would suggest that there is likely to be a distributary channel between the river and the lagoon. I wanted to ask you whether that slope is clearly visible now? If one looks at that area between the river and the lagoon, would one see the slope to which you refer? That is the first thing. And I imagine that it is not every slope that would facilitate flow. Is there a minimum dimension or gradient that a slope would need to have to facilitate the flow? And thirdly, what is your view as to whether the slope which is now there was present 150 years ago?

Mr. KONDOLF: I realize that my text perhaps was not entirely clear. In the previous sentence I referred to the Río San Juan at high water, overflowing into distributary channels leading to Harbor Head Lagoon and then, in the next sentence, I referred to the slope of the river to the lagoon. The slope I am referring to is the slope that occurs when you have high water in the main river — the river is in flood and so the river level can go up significantly so that the level of the river is quite a bit higher than Harbor Head Lagoon and the ocean. And so it is this slope from the higher water during the floods that drives the flow towards Harbor Head Lagoon and, in general, away from the main river to various distributaries. Does that answer your question?

Judge ROBINSON: I also wanted your view as to whether that slope would have existed with the same dimensions 150 years ago.

Mr. KONDOLF: Yes. I would say the answer is “yes”, in that for a given flood, or a given flood water surface in the main river channel you would have similar slopes away from the river towards the lagoon. The actual path that the water would take would be generally the lower parts of the landscape — what we would call channels or swales — so the water flow would tend to be

concentrated in these lower places or channels to reach Harbor Head Lagoon or other places. The river is not just overflowing into Harbor Head Lagoon —it is overflowing throughout the delta during these floods. So there is no reason to expect that things would be substantively different in the past.

Judge ROBINSON: Thank you very much.

Le PRESIDENT : Merci, Monsieur Kondolf. Ainsi s'achève votre déposition. Nous tenons à vous remercier d'avoir bien voulu comparaître devant la Cour. Vous pouvez à présent quitter la barre, Monsieur le professeur.

Mr. KONDOLF: Thank you for the opportunity to address you.

Le PRESIDENT : Ainsi s'achève l'audience de ce matin. La Cour se réunira de nouveau cet après-midi à 15 heures. Je vous remercie. L'audience est levée.

L'audience est levée à 12 h 25.

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