Bernhard Kitous
École des hautes études en sciences sociales
Bernhard.Kitous@ehess.fr

Mediation Using Verbal Matrix Analysis?
The Case of the Water Framework Directive
(WFD) in Normandy

Abstract: This paper relates to a durable conflict over water rights and its potential resolution by Verbal Matrix analysis, a method inspired by the work of cartographer Jacques Bertin (1967), which was recently digitized. Specifically, it provides an answer to the question, "How to deal with situations locked down by antagonistic positions on major public choices?" The case discussed involves a dispute taking place near the Bay of Mont-Saint-Michel, over a decision by the State of France to remove two dams which have become well integrated into the Normandy landscape for over a century. Around 800 A.D, the river Sélune was established by Emperor Carolus Magnus as the frontier between Normandy and Brittany since it was considered a dangerous series of canyon-like impassable waters. A few bridges and watermills comprised the only infrastructure until 1907 when a project of electrification proposed two hydropower dams to tame its tumultuous waters; in 1914 the Great War precipitated the decision to build the La-Roche-Qui-Boit dam, and later in 1932 the Great Depression led to a second hydropower dam being designed upstream at Vezins. Both dams produce electricity and create huge freshwater reservoirs 25 kms long, making Sélune an active valley for electrical industries and an attractive place for lake fishing. Family tourism has also developed along with a Disney-like park, nautical resort, forest trails and horse-riding activities (250,000 visitors/year).

Since 2001 however, under the auspices of implementing the European Water Framework Directive, a money-making lobby wants to drain both reservoirs and remove the dams, under pretext of the so-called "salmon-comeback" initiative; actually, there is no problem with salmon since the Sélune's sister river, the Sey, provides the second most important salmon fishing reserve in France. The consequence of removing the dams would be to create uncertain risks of flooding and deprive nuclear reactors (60kms away) from backup resources of freshwater in the event of a reactor accident. Benefit-wise, removal of the dams would give control to the salmon-comeback lobby group which would then take over the Sélune's freshwater resource in its entirety. While the water agency concerned provides perks to elected representatives who support removal of the dams, no compensation is offered to local communities at risk of losing jobs, homes and their cherished landscape. The quarrel is now becoming a war based upon the fanaticism of "pros" v "cons". This paper shows how mediation using Verbal Matrix could take place with word sets oriented towards risk-management rather than demolition of the dams and draining of the

reservoirs. Accordingly, it is suggested that the Verbal Matrix method can be an approach for reaching agreement and peace-making in durable conflicts.

Keywords: Normandy Waters, Verbal-Matrix, Atlantic Salmon (salmo salar) migrations, hydropower, chemical pollutants, alternate dispute resolution. (Technical glossary at article's end)

1. What is a Verbal Matrix?

A verbal matrix is similar to a mathematical matrix where, instead of (quantitative) numbers, data are (qualitative) words; for instance, the matrix presented in Table 1 has 26 rows representing the "actors in the Sélune case study" and 16 columns with: (a) first column = the actors' names; (b) columns 2 to 16 = fifteen attributes qualifying each of the 26 actors.

The list of attributes (presented as columns) encompasses all aspects judged relevant to appraise the position of actors relative to issues such as: 1) existence of two lakes; 2) presence of chemicals; 3) costs of removal; 4) actual piercing of dam walls and dikes; 5) eutrophication issues; 6) floods; 7) European Law category HMWB (heavily modified water body); 8) & 9) Hydropower: output v revenues; 10) motivation to economics (Ange Michel park); 11) geographical dimensions over river basin length (93 kms); 12) and 13) salmon (E.U fishing quotas or "TACs"); 14) Very high tension electricity power lines (THT in French); 15) proximity of nuclear reactors.

Table A1. Empty verbal matrix, with actors as Rows (26) & facts as Columns (15)

NAME	2lakes	chemics	costs	piercing	eutroph	floods	HMWB	H-output	H-revenu	AngeMi	Length	S-quota	S-flows	THT	Nuclear
ADB amis des barrages															
Amis de la Sélune															
AntiNuclear Manche															
BaieBocage syndicat eaux															
CNRS-Univ de Nanterre															
Community Commune															
Deputy canton Avranches															
ELECTROPOLI															
ERN-SOS Loire Vivante															
Fishermen Salmon															
FishingPonds whitefishes															
Group of 6															
INRA Bagliniere / Prevost															
Maire Avranch															
Mairie Vézins-St-Hilaire															
Manche-Nature															
Mission Sélune															
Minister(S.Royal)															
Biodiv.Pompili															
Mixt.SyndicBay															
NERON enquêt publ.2014															
NORMANDY WATERS ag															
Parc Archangel Michael															
PERRIN repor To Minister															
Senators															
WWF FRANCE															

Source: B. Kitous

Table A2. Technical qualifiers in Verbal matrix / Row –actors (26) vs Columns – facts (15)

ACTOR	2lakes	chemics	costs	piercing	eutroph	floods	HMWB	H-output	H-revenu	AngeMi	Length	S-quota	S-flows	THT	Nuclear
>ADB amis	operational	floodraught	costeffect	floodraught	costeffect	floodraught	economy	costeffect	economy	economy	operational	operational	operational	powerout	terror
>Amis de la	dambreak	chemical	economy	continuity	dambreak	economy	chemical	dambreak	economy	operational	continuity	operational	continuity	continuity	chemical
>AntiNucle	powerout	continuity	economy	powerout	chemical	powerout	powerout	powerout	powerout	powerout	operational	operational	operational	powerout	powerout
>BaieBoca	continuity	continuity	costeffect	dambreak	dambreak	chemical	chemical	powerout	economy	chemical	operational	economy	economy	seismic	powerout
>CNRS-Uni	floodraught	chemical	economy	continuity	chemical	floodraught	powerout	economy	economy	operational	continuity	costeffect	economy	continuity	powerout
>Communit	operational	operational	operational	operational	chemical	floodraught	costeffect	costeffect	economy	economy	operational	economy	costeffect	powerout	terror
>Deputy cal	economy	economy	operational	economy	costeffect	economy	economy	costeffect	economy	economy	economy	economy	costeffect	powerout	terror
>ELECTRO	costeffect	costeffect	chemical	economy	costeffect	economy	operational	costeffect	economy	economy	economy	continuity	operational	powerout	terror
>ERN-SOS	continuity	continuity	economy	dambreak	dambreak	floodraught	chemical	dambreak	operational	operational	continuity	costeffect	economy	continuity	chemical
>Fishermer	continuity	chemical	dambreak	continuity	chemical	terror	dambreak	dambreak	operational	chemical	continuity	costeffect	continuity	continuity	chemical
>FishingPo	chemical	chemical	operational	terror	chemical	terror	economy	operational	economy	economy	economy	economy	operational	powerout	powerout
>Group of c	powerout	costeffect	costeffect	costeffect	costeffect	floodraught	costeffect	costeffect	economy	economy	economy	economy	operational	powerout	terror
>INRA Bag	continuity	operational	continuity	dambreak	dambreak	floodraught	chemical	dambreak	continuity	operational	dambreak	costeffect	continuity	continuity	chemical
>Maire Avr	operational	chemical	costeffect	operational	chemical	economy	operational	powerout	operational	chemical	economy	economy	continuity	powerout	powerout
>Mairie Vé	economy	operational	economy	terror	dambreak	terror	operational	costeffect	economy	economy	economy	costeffect	operational	powerout	terror
>Manche-N	continuity	continuity	economy	dambreak	dambreak	dambreak	chemical	dambreak	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Mission Sid	dambreak	floodraught	continuity	dambreak	dambreak	floodraught	chemical	dambreak	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Minister[S	economy	costeffect	economy	floodraught	costeffect	floodraught	costeffect	costeffect	economy	economy	dambreak	continity	continuity	powerout	terror
>Biodiv.Por	continuity	chemical	continuity	dambreak	continuity	continuity	dambreak	dambreak	continuity	operational	continuity	continuity	continuity	continuity	chemical
>Mixt.Synd	seismic	floodraught	costeffect	floodraught	dambreak	floodraught	chemical	operational	operational	economy	continuity	economy	continuity	powerout	powerout
>NERON el	continuity	dambreak	dambreak	continuity	dambreak	continuity	dambreak	dambreak	continuity	operational	continuity	costeffect	continuity	continuity	chemical
>NORMAN	continuity	dambreak	dambreak	continuity	dambreak	floodraught	chemical	continuity	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Parc Arch	economy	costeffect	costeffect	terror	costeffect	powerout	operational	costeffect	economy	economy	economy	economy	economy	powerout	terror
>PERRIN rt	continuity	dambreak	dambreak	continuity	dambreak	dambreak	dambreak	dambreak	continuity	operational	dambreak	costeffect	continuity	continuity	chemical
>Senators	continuity	dambreak	dambreak	continuity	chemical	floodraught	dambreak	costeffect	economy	economy	economy	economy	costeffect	seismic	powerout
>WWF FR	continuity	dambreak	economy	dambreak	dambreak	continuity	chemical	continuity	continuity	operational	dambreak	costeffect	continuity	continuity	chemical

Source: B. Kitous

Here the Verbal Matrix is presented twice, firstly as Table A1 (empty) and secondly as Table A2 (bearing the technical words appropriate to qualify each actor's attitude towards the technical facts of the Sélune case). Their useful dimensions are 26 actors * 15 criteria (or attributes), providing for 390 cells; each cell expresses verbally (one word) the position of the (line) actor over the (column) attribute; here these words qualify the technical areas of concern for risks such as flood; continuity (ecological); power outage; dam breaching; economy; terror attack; etc.

Describing the history of the Sélune dams requires paying attention to key moments in time: (1) in 1927 the Conseil d'Etat (the highest French judicial court on administrative Law) deliberated and approved on a Decree by the Doumergue (the president of the Republic) stating (article 5): "no transfer of dam hydropower public contract and dealership may be done without another Decree deliberated by the Conseil d'Etat"; (2) in 1946 the private company operating both dams (Society of Sélune Forces) had its assets sold and was integrated into the public state corporation EDF (Electricity of France) while the hydropower contract was upheld unchanged; (3) given the rule to empty and clean out the reservoirs every decade, a major incident occurred in 1993 when, during the process of emptying the reservoirs, the work was disrupted by terrible storms and heavy rains (unexpected during the summer season) and furious floods subsequently carried the Sélune alluvia, including chemical pollutants, into the Bay of Mont-Saint-Michel. The impact of this incident, which could have been minor had the prefecture acted to close the dam sluices in a timely manner, was later described as "Sélune Tchernobyl" by M. Thoury, the mayor of St-James and chairman of the South-Avranches Water System based on the Sélune waters; (4) in 2006 the European Water Framework Directive (WFD) was transposed into French Law; in 2007 M. Thoury (who had become a key political opponent to the dams and reservoirs) met with President Sarkozy and convinced him to set Sélun as an example of ecological continuity; (5) in 2007-2008 Sarkozy's "1st Grenelle de l'environnement" (Grenelle being the French Downing street) and later in 2009 the "2nd Grenelle", when the Sélune became a national target for removal of the dams; from 2009 to 2012, EDF had its two hydropower contracts cancelled while Green activists stopped demonstrating against High-Power Voltage lines in Normandy (connecting nuclear power stations to the national grid). From 2012 on, the administration continued setting up the means to proceed with draining the reservoirs and demolishing the dams. This created conflict between strict enemies, on the one hand the ADB (friends of the dam) who hoped to find a new operator (Valorem) to replace EDF, and on the other, the ADS (friends of the Sélune) who required immediate removal of the dams (F.Nicolino). Table 2 shows the "Actors" and their positions "Against" removal or "In favor" of removal; "Neutral" positions are precautionary stands by actors who fear reprisal from the WA or from the State.

2. Who are the actors in the Sélune case study?

Table B. 2007-2017 Actors (27 = 12 in favor of dismantling / 8 against dismantling / 7 neutral)

NAME by alphabetical order	PLACE	Position with respect/ dams
ADB amis des barrages (J. Kaniowsky)	St Hilaire Harcouet	Against
Amis de la Sélune (R. Epple, M. Thoury, M.Nicolino)	Le Puy en Velay	In favor
Anti-Nuclear Manche (M. Didier Anger)	Cherbourg	Against
Baie Bocage syndicat eaux (M. Thoury Mme. Panassie)	St James	In favour
CNRS-Univ de Nanterre (Mme. Germaine)	Nanterre	Neutral
Community of communes Avranches (M. Nicolas)	Avranches	Neutral
Deputy canton Avranches (M. Huet)	Avranches	Against
Electropoli (M. Veyrat)	St James	Against
ERN-SOS Loire Vivante (M. Epple)	Le Puy	In favour
Fishermen Salmon (M. Doron M. Thoury)	Paris	In favour
Fishing Ponds coarse fish (General de Tonquedec)	Ducey	Against
Group of 6 (MM. Varinot, Vesseron, Lefeuvre, Gonthier, et al.)	Paris-Normandy	Against
INRA (MM. Bagliniere and Prevost)	Rennes-St Pé-Bigorre	In favour
Entre Lac et Mer (MM. Fauchon)	Avranches	Against
Mairie Vézins-Isigny-le-Buat (M. Goupil, Mme Crochet)	St Lo	Neutral
Manche-Nature (M.Doron) FNE (M. L'Hostis)	St Lo	In favour
Mission Selune (prefecture MM. Brun & Beree)	St Lo	Neutral
Ministers of State (S.Royal, N.Hulot)	Paris Neutral	
Minister Under Secretary of State (B.Pompili)	St Lo	In favour
Bay of Mont St Michael Mixt Syndicate MM. Badiou & Bouvet	St Hilaire Harcouet	In favour
Mr NERON enquęte publique 2014 public inquiry (M.Vindimian)	St Lo	In favour
NORMANDY WATERS (agence Eau Seine-Normandy) M.Berne	Rouen	In favour
Parc Archangel Michel (parc ange Michel-M. & Mme. Gougeon)	Ducey-Isigny	Against
PERRIN 2015 report to Minister of State (M.Vindimian)	Paris	Neutral
Senators (MM. Bizet and Bas)	Paris and Saint-Lo	One in favour; one Neutral
WWF FRANCE (Mme Autissier)	Paris	In favor

Source: B. Kitous

3. From 1906 to 2017: how political consensus on electricity was built up to 2007, then broken down until now

In 1906 the president of the Council of Ministers in France (1906-1909), Georges Clemenceau, led a policy of electrification under which major cities were enco-

uraged to promote public lighting and utilities by taking advantage of the availability of nearby rivers to produce electricity to meet regional needs. In 1907, Clemenceau sent three ministers to instruct the Avranches' case for electrification beginning in Normandy, a city lucky enough to be located between two rivers, the Sélune and the Sey, both having high hydropower potential. A compromise was struck in which the Sélune, renowned for its sudden floods, would be dammed while the Sey would remain free-flowing allowing fish to migrate in their natural pattern. Later during WWI, Clemenceau, (then prime minister for a second term 1917-1920), facing tough military battles against General Ludendorff which threatened to cut the Allied lines North by Northwest of Paris, added strategic pressure to construct the first hydropower dam on the Sélune; therefore, enabling the French government to withdraw from Paris to Normandy should Ludendorff succeed. Later in 1932, a second hydropower dam was completed upstream at Vezins, both dams being placed under a legal 70-year contract with the French State, on an installed annual capacity of 14 MW annually providing 25 GWh to the national power grid, mainly at peak hours. The availability of electric power brought industrial development like the Electropoli chemical plant on the Yvrande, a tributary of the Sélune, with most of its industrial waste being dumped indirectly into the Sélune. This created an agenda for M. Thoury, Mayor of St-James, to remove the dams which were seen as responsible for the dumping of chemical waste. The city of St-James, having the privilege of hosting the American War Cemetery for Western France, allowed M. Thoury to benefit from international meetings; his position as chairman of the Local Water Committee (CLE) and Water Planning Scheme (SAGE), together with being president of the water factory syndicate and vice-president of the Manche department, gave M. Thoury the leverage to make the Sélune an exemplary illustration of Green Policy in Normandy, particularly when nuclear power reactors provided an abundance of electricity from the generating facility at Flamanville (60 kms North of the Sélune).

The following tables seek to explain the reasons for conflicting views on the Sélune river:

α- water bodies on the Sélune: tentative numbering of 45 Water Directive impoundments;

β -estimated costs and who pays for them (Normandy Waters Agency to full 100%);

γ- time-line account of decisions and events (considerable fluctuations observed over time from 1993 on);

δ- verbal qualifiers of technical risk areas, useful for Verbal Matrix methodology;

ε- provisional statistics on the "two reservoirs" attribute number of agreements over = 26 actors;

ζ- Statistical account of dualistic positions of actors, maintaining conflict as huge, durable, unsolvable.

Sélune encompasses much more water bodies than the apparent "two dams" assertion; removing dams means managing at least 45 water bodies.

Table C1. Sélune = at least 45 water bodies according to WFD 2000, article 5.

Category	Modification	#	Specified use-breakdown
River Sélune tributaries Air, Airon, Yvrande, etc.	Bridges, Dikes and former Mills	4	flood protection
			protection of wider environment from contaminated sediment (see below)
	Impoundment	11	Water supply pumps & sockets, etc.
			Bridges
			Electricity transport connection & sockets
	Chemical Plant	2	Artificial water usage facilities
Reservoir 1 Vezins	Reservoir	1	Length = 20 kms up to ST-HILAIRE
	Impoundment	18	Turbines power generation
			Sports resorts
			Bridges, canals & Electricity transport infrastructure connection to THT
Reservoir 2 Roche-qui-boit	Drinking water supply	2	Upstream Baie-Bocage water pump/gateway
	Impoundment	3	Bridges & Electricity transport infrastructure connection to THT
	Reservoir	1	Length = 5 km up to VEZINS
Dikes Artificial WB	Flood Defence Works	3	Downstream flow protection Ducey, Pontaubault, Bay Mont-Saint-Michel, etc.

Source: B. Kitous

When considering the European WFD and how Normandy Waters forced its implementation on the Sélune and its valleys, one finds reasons for the violence observed between opposing groups, leading to acts of vandalism against hydropower structures. Provided there are at least 45 water infrastructures concerned by the Sélune renaturation project, it is surprising to learn that, in order to obtain approval for its dam removal project, the Water Agency scaled down figures declared on the Waters Data Base registered at European level. This means that the required identification of potential HMWB and potential AWB has been bypassed by the French authorities contrary to Common Implementation Strategy (CIS) guidelines; tests applicable in the establishment of environmental quality objectives for the designated Sélune water bodies have been bypassed; for instance, the dam and reservoir at la Roche qui Boit are not declared to Brussels, while the length of the Sélune is stated as being 68 kms. when in fact it runs for over 93 kms. from its source to the Bay Mont-St-Michel.

Table C2. Estimated costs of the total operation including: demolition and removal of two Dams

Action	Who	Share of spending	Costs Mio Euro	Responsible
Decision	State Minister of Ecology	Unknown (0% ?)	To be confirmed	Prefecture Manche Mission Sélune

Budget	Program 113 Sustainable development	Not forecasted by the State=0% principle	More than 57 mio Euros	Call for tenders July 2016
Realization operator	Water Agency Normandy	Derogatory rate 100% of costs covered by Water Agency	47 mio Euros allegedly already engaged officially	Sub-contractors (Vinci BTP group and subsidiaries)

Source: National Court of Accounts, Cour des Comptes, Paris, Report Feb 2015, p. 98.

One of the most significant features is the total 100% financing of the project "offered" to the French State by the Normandy Water Agency in a trade-off for draining the reservoirs and demolishing the dams; this unusual feature breaks the balance of powers as established by the No.1 principle in French Public Law: anytime there is a joint-venture between the state and a private or half-public sector operator, there has to be a sharing of costs (never 100% for only one of the contractors, including the French State). In the case of the Sélune, this surprising derogation to sharing costs creates an advantage in favor of the Water Agency over state institutions (both Ministry and Prefecture). In other words, through its commitment to bear the whole of the project costs, the Water Agency has achieved absolute control over removal of the Sélune dams while gaining 100% of the water rights, all under the pretext of salmon migration.

Table D1. Decision-making from 1993 to 2014 on Sélune case.

When?	Who ?	Where ?	What?
1993	Manche Prefecture & EDF decide on Emptying 2 dams	St Lo & sites of 2 dams	Emptying of the 2 lakes in Summer with extreme floods of polluted chemicals(Selune river is known since the Middle-Ages for its catastrophes)
2003-2008	Mayor Mr Thoury president of CLE & redactor of SAGE	St James, St Lo & Paris	Chairman Water-sewage-plant &Mayor sets plans to increase drinking water supply with back up from Paris' Sarkozy Grenelle plans
October 2009	Minister Ms Jouanno	Lisieux	Decision to remove 2 Dams on Selune as a key communication Grenelle-Environment
2012	Minister Ms KosciuskoMorizet	Paris	Decision to stop EDF 70-years concession which had been renewed in 2002
Dec 2012-Feb 2013	Mr Berne, Head of rivers@W.Agency	Rouen	WA votes PTAP which backs up decision to remove Dams, prior to any public consultation
2012-2014	Mayor-Deputy G.Huet	Avranches & Paris	Fights salmon pretext- for sister river of Sélune (Sée)has 1,200 salmon fish-rights
January to October 2014	Mr Neron. Minist MsBatho/MrMartin	Saint-Lo & Paris	Public interest inquiry decides to include Internet partisans of Dam removal
April to December 2014	Ms Royal minister	Paris & Vezins	Ms Royal evaluates costs of Dams removal too high; visits Dams; decides to proceed to a counter-expertise to assess undue charges

Source: B. Kitous

Over a 21-year period of Sélune management, the Water Agency has supplanted three levels of State administration - nation France, region Normandy and district-department Manche – availing itself of European directive WFD while not applying its recommendations on cost-benefit analysis, implementation strategy and thorough public consultation. By way of paradox, while the European fishing quota "Total al-

lowances TAC" make the Sey-Sélune together the 2nd largest salmon fishing domain in France, the Water Agency singles out the river Sélune and targets it to possess full rights over the river's 93 kms length "*sub specie aeternitatis*": this business strategy creates a monopoly over the Sélune's fresh water resources (at the expense of depriving other users of the river's multi-use balance) and rejuvenates the risks of dramatic unpredictable floods which have been managed since 1917 by the two dams day-to-day water level maintenance services.

Table D2. Decision-making from 2015 to 2017 on the Sélune case

When?	Who?	Where?	What?
January 2015	Minister Ms. Royal	Paris	Decision to appoint 3 experts of which 2 are the same as on the Neron committee (inspectors: Perrin/Cholley/Vindimian)
February 2015	Ms. Royal	Paris	Decision: public interest on Sélune needs public vote (referendum of local interest)
February 2015	M. Thoury - Mayor and Water chairman	St James	Leader promoting dam removal has fatal road accident on same day as appointment with Inspectors Perrin-Cholley-Vindimian
April 2015	Ms. Perrin from the Minister's staff	Paris & Saint-Lo	Meeting at Manche Prefecture Ms Polve-Montasson with inspectors Cholley & Vindimian
April-May 2015	Mayor D.Nicolas	Avranches	Mayor Huet is beaten by young challenger who wishes water barons' success
May 2015	Deputy Huet	Avranches & Paris	Deputy Huet is elected chairman of the new commune Mont-St-Michel Avranches
June 2015	Minister Ms Royal	Paris	Minister says Referendum not possible by letter to senator Bizet largely publicized
July 2015	Chairman Huet MtStMichel	Avranches & Paris	Local referendum project does not succeed at community Mont-St-Michel_Avranches
April 2016 and May 2016	Ms. Dulamon under-Prefect	Avranches	Meeting with Mission Sélune following M.Nicolino materials for 13 april Charlie's "Royal amoureuse des barrages" with violent negating of risks
May to October 2016	M. Witkowski - Prefect Call for tenders	St Lo	Choice of VINCI group launch of Sélune draining over 30 months (instead of 5 months) plus scraping and displacment of sediment >560.000 m3
January 2017	M. David Nicolas elect. Chair Avranche Mont-St-Michel Urban City. M. Sabathé - new Prefect (replaces Witkowski in less than 14 months)	MtStMichel Avranches & Vezins	Constitution of New local government (incorporating one hundred communes). Meeting at Dam reservoirs to present VINCI contract to clean the Sélune of chemical waste *Meeting launches the Commission Locale d'Information C.L.I.*

Source: B. Kitous

4. Verbal Matrix approach utilizes "significant words" to express Actors' positioning - Matrix analysis discipline in VERBAL DATABASES & Methodology of CLUSTERING

Based upon Jacques Bertin's work (1967), the method associates data-tables with matrix displays and statistical clustering; it is a discipline enabling researchers to be attentive to all possible options when confronted with VERBAL data-tables; it provides for Analytical processing as well as Synthesis: "**Matrix" (from Mater-mother in Latin) means** that each data-table considers the matrix as the mother of a whole process. Verbal because the raw data are under formats of "words" such as the glossary given in Table E1.

Table E1. VERBAL qualifiers of seriousness of risks and scientific relevance

VERBAL qualifiers of RISK (rated over/20)	Dependency on ACTUAL HISTORY' perception(actuarial)
CRITICAL RISK	18/20
HIGH RISK	16/20
LIMITED RISK	9/20
LOW RISK	7/20
MODERATE RISK	11/20
NULL RISK	1/20
PREDICTABLE	13/20
PROBED RISK	19/20
SERIOUS RISK	15/20

Source: B. Kitous

Connecting contents with formats is the crux of the matter, involving both visual access and professional meaning: with ordinary statistical tables, processing VERBAL into NUMERICAL data. The inquiry looks for simpler structures to cluster out and display logical trees (dendograms) which show branches and leaves helping the researcher to find "significant clusters". For now, we will look at full verbal data over a whole matrix; and we suggest how to connect words (=verbal=) with mathematics (=numbers=) into a specific analytic way where Verbal material (=words=) are considered the basis for computation, classifications, and structure-finding in a data set. Jacques Bertin suggests using the ≠ sign to convey the fact that "words" differentiate "things"; we shall do the same here.

Tables E1, E2 & E3 illustrate how the conflict crystallizes over very few words creating polarities in peoples' minds; this empirical observation on the impact of words on collective behaviors tally with Viktor Klemperer philological observations during World War II. Insoluble conflicts are born from "frozen situations" (Kurt Lewin's expression) placed under a few all-powerful words shared by dominant actors.

Table E2. Qualifiers of risk-technical areas

Chemical risk	Displacing several thousand tons of pollutants
Continuity ecological risk	All risks diverging from good ecological potential
Cost-effectiveness risk	Risk of a financial nature, including 100% derogatory giving all power to the Normandy Water Agency (as opposed to the State)
Dam breaching risk	Could result from lack of maintenance (no "grand carénage")
Economy tourist/energy/wood	All activities induced by Bay Tourism (primary base, J. Jacobs)
Floods/drought risk	More generally: all climatic risks
Operational and human risks	General observations made in catastrophes involving a human component
Power outage electric power out	By nuclear accident or other reason (local, regional or national)
seismic and/or Tsunami-like risk	Cf Jersey 709 tsunami epicenter (Brittany 2014 Table-of-Risks)
Terror acts risk	Any unpredictable action by terrorists, including green fanatics and others

Source: B. Kitous

In Table E3 a majority of opinions underline the arguments of continuity (ecological) and potential cracks in the two dams; one minority stresses the costs of the economic downturn which dam removal will bring (loss of >100 jobs); another minority takes notice of operational risks, potential risks with chemical removal, and seismic dangers. But very few actors identify electrical shutdown risk and the dangers of flooding. Nobody mentions the risk of terrorist attacks on the Sélune structures.

Table E3. Statistics from Tables A2 & E1: perception of risks by the Actors

Qualifiers=>	Continuity,Crack	Economy,Cost	Operation,Chemic,Sism	Electr,Flood,Terror
Majority of actors	13			
Significant minorities		5	5	
Few actors				3

Source: B. Kitous

Before processing the verbal matrix data, there remains to express one regret, that is the sorry observation that the administration did not do a sound, thorough and serious presentation of facts and figures relevant in the Sélune case. As a matter of fact, the research has discovered quite a number of flaws in the data officially given to state ministers and to the Brussels authorities. All flaws converge to the same end: make believe that the Sélune river is unimportant, and removal of the dams is only a question of will; No operational consequences have been seriously explored, not even the evocation of salmon migration and reproduction.

Table F. Facts vs Allegations at Sélune (excluding the estuary with Sey and common TAC)

Fact	*Distortion*	*Author*
2 reservoirs:20km (V) and 5km (RQB)	Only 1 reservoir declared Arnhem convention – Eaux France	Normandy Waters Agency

Chemicals sediments over 40 years	Feasible to transport all sediments away from the Sélune and its tributaries	Mission Sélune call for tenders
Costs over 70 million Euro	Simple demolition cost <5 mio Euros; other costs identical if dams retained	Ms. Perrin oral report April 2015
Draining-Piercing no shell maintenance	Draining only assured no shell piercing for 2 years	Mission Sélune call for tenders
Eutrophication	Eutrophication forbids fishing	Normandy Waters Agency
Floods dangers over decades	Never any flooding danger	Letter ref the Sélune 06-2016
HMWB:EU obligation to declare	HMWB : no declaration made on the Sélune	Normandy Waters Agency
Hydro-Electric output & revenues	Weak 0.04% national product + revenues at Sélune are <0	Mission Sélune
Sharing of Water Rights	Exclusive 100% water rights	Normandy Waters Agency
Parc Archangel: at lake edges	Parc declared 3 kms away	Perrin Report "hors sol"
River Sélune actual length 93 km	Declared length 68 km only	Normandy Waters Agency
Salmon presence/Quota 1200 head	Salmon total disappearance	Normandy Waters Agency
Salmon up & down flows possible	Salmon flow total impossibility	Mission Sélune
Power Line THT right on river site	Power line not mentioned	Perrin Report
Zone of 5 nuclear sites - 4 reactors	Zero nuclear risk	There is no 'risk no help from reservoirs thus No future'

Source: B. Kitous

5. Verbal Matrix analysis and synthesis: Results and Discussion

From now on, let us look at full verbal data over whole matrices, connecting words (=verbal=) with mathematics (=numbers=) into a specific analytic way where Verbal material (=words=) are considered a basis for computation, classifications, and structure-finding in a data set. Here a set of 2 VERBAL MATRIX tables is presented detailing the procedure and its results on two matrices of 26 rows * 15 columns (Tables G1 & G2). Then the actual statistical clustering with the UPGMA algorithm (unweighted pairs mean algorithm) provides two other displays, clustering trees (dendograms) showing the proximities and differences between Actors, depending on which verbal data is chosen.

Table G1. Gravity qualifiers verbal matrix / row-actors (26) and columns-facts (15)

NAME	2lakes	chemics	costs	piercing	eutroph	floods	HMWB	H-output	H-revenu	AngelMi	Length	S-quota	S-flows	THT	Nuclear
>ADB	HIGH	LOW	LOW	HIGH	LOW	MODERATE	NULL	HIGH	HIGH	MODERATE	NULL	NULL	NULL	MODERATE	MODERATE
>ADS	NULL	MODERATE	NULL	NULL	LIMITED	LOW	NULL	NULL	NULL	NULL	NULL	SERIOUS	SERIOUS	NULL	NULL
>AntiNuke	HIGH	MODERATE	LOW	LIMITED	HIGH	LOW	LOW	HIGH	HIGH	NULL	LOW	LOW	LOW	NULL	CRITICAL
>BayBocag	LOW	HIGH	LIMITED	NULL	HIGH	MODERATE	NULL	NULL	NULL	LIMITED	LOW	HIGH	CRITICAL	NULL	NULL
>Nanterre	NULL	HIGH	LOW	NULL	SERIOUS	LOW	NULL	NULL	NULL	LIMITED	LOW	HIGH	CRITICAL	NULL	MODERATE
>CommuniC	HIGH	HIGH	HIGH	CRITICAL	LIMITED	SERIOUS	MODERATE	LOW	NULL	HIGH	LIMITED	LOW	MODERATE	HIGH	NULL
>Deputy	HIGH	MODERATE	HIGH	CRITICAL	LIMITED	SERIOUS	MODERATE	HIGH	HIGH	HIGH	LIMITED	LOW	LOW	HIGH	MODERATE
>electropoli	SERIOUS	NULL	NULL	CRITICAL	LOW	LOW	HIGH	HIGH	NULL	MODERATE	LOW	LOW	LOW	HIGH	LOW
>EfN	NULL	HIGH	NULL	NULL	HIGH	NULL	NULL	NULL	NULL	LIMITED	NULL	HIGH	CRITICAL	NULL	NULL
>FishSalmo	NULL	HIGH	NULL	NULL	SERIOUS	LOW	NULL	NULL	NULL	HIGH	NULL	HIGH	CRITICAL	NULL	LOW
>FishwhiteF	SERIOUS	HIGH	HIGH	CRITICAL	LIMITED	SERIOUS	HIGH	LIMITED	LIMITED	HIGH	HIGH	LOW	MODERATE	HIGH	LOW
>Group of 6	SERIOUS	MODERATE	HIGH	CRITICAL	LIMITED	CRITICAL	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	MODERATE	HIGH	CRITICAL
>INRA renn	NULL	HIGH	NULL	NULL	HIGH	MODERATE	MODERATE	NULL	NULL	LIMITED	LIMITED	HIGH	HIGH	NULL	NULL
>MayorAir	LOW	MODERATE	LOW	LIMITED	LIMITED	SERIOUS	MODERATE	LOW	LIMITED	MODERATE	LIMITED	MODERATE	MODERATE	LIMITED	MODERATE
>MayorVez	CRITICAL	MODERATE	HIGH	CRITICAL	LIMITED	CRITICAL	CRITICAL	HIGH	HIGH	HIGH	HIGH	MODERATE	MODERATE	HIGH	HIGH
>MarchNat	NULL	HIGH	NULL	NULL	SERIOUS	NULL	NULL	NULL	NULL	NULL	NULL	CRITICAL	CRITICAL	NULL	NULL
>MissSelu	LOW	HIGH	LIMITED	LOW	SERIOUS	MODERATE	NULL	LIMITED	LIMITED	LIMITED	LIMITED	HIGH	HIGH	HIGH	LOW
>Min-Royal	MODERATE	MODERATE	HIGH	LIMITED	HIGH	CRITICAL	MODERATE	LOW	LOW	LIMITED	LIMITED	LOW	MODERATE	HIGH	HIGH
>Min-Pomp	LOW	HIGH	LIMITED	LIMITED	SERIOUS	LOW	MODERATE	LOW	LOW	LIMITED	NULL	CRITICAL	HIGH	LIMITED	MODERATE
>Mixt-SBay	LOW	HIGH	LOW	LIMITED	LIMITED	MODERATE	MODERATE	NULL	NULL	MODERATE	LIMITED	HIGH	HIGH	LIMITED	NULL
>Nero2014	NULL	MODERATE	LOW	LOW	SERIOUS	NULL	NULL	LIMITED	LIMITED	NULL	NULL	CRITICAL	CRITICAL	NULL	NULL
>N-waters	NULL	HIGH	NULL	NULL	HIGH	MODERATE	NULL	NULL	NULL	LOW	HIGH	HIGH	HIGH	LIMITED	MODERATE
>ParkMicha	CRITICAL	MODERATE	HIGH	CRITICAL	LIMITED	MODERATE	CRITICAL	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LIMITED	LOW
>PERReport	LOW	HIGH	NULL	LOW	SERIOUS	MODERATE	NULL	LIMITED	LIMITED	NULL	LIMITED	HIGH	CRITICAL	LIMITED	NULL
>Senators	MODERATE	NULL	LIMITED	LOW	HIGH	LOW	NULL	LIMITED	LOW	LOW	LIMITED	MODERATE	HIGH	LIMITED	NULL
>wwf-Fr	NULL	HIGH	NULL	NULL	SERIOUS	NULL	NULL	NULL	NULL	NULL	NULL	CRITICAL	CRITICAL	NULL	MODERATE
NAME	2lakes	chemics	costs	piercing	eutroph	floods	HMWB	H-output	H-revenu	AngelMi	Length	S-quota	S-flows	THT	Nuclear

1-Graphic Display 1 comparison between actors (based on Table G1- Gravity of Risks) = calculus with bootstrap percent (% fit) between branches and squares of differences. The UPGMA method has been chosen. 26 rows with 15 variables in each row have been analyzed.

The Sum of squares method has been used to compare between sets of variables.

100 bootstrap replicates have been generated.

NEWICK FORMAT OF CLUSTERS/ ((Group:0.231,MayorVez:0.231):0.068,ParkMicha:0.299):0.077):0.006,FishwhiteF:0.382):0.030,electropoli:0.411):0.028):0.007,MinRoyal:0.446):0.037):-0.006,((((ADS:0.276,(FishSalmo:0.180,(ManchNat:0.064,wwf-Fr:0.064):0.116):0.096):0.055,(((BayBocag:0.180,ERN:0.180):0.074,Nanterre:0.254):0.063,(INRA:0.278,Nwaters:0.278):0.039):0.015):0.077,((MissSelu:0.278,PERReport:0.278):0.071,Nero2014:0.349):0.060):0.057,(((MayorAvr:0.358,MixtS-Bay:0.358): 0.062,MinPomp:0.420):0.043,Senators:0.463):0.003):0.023);
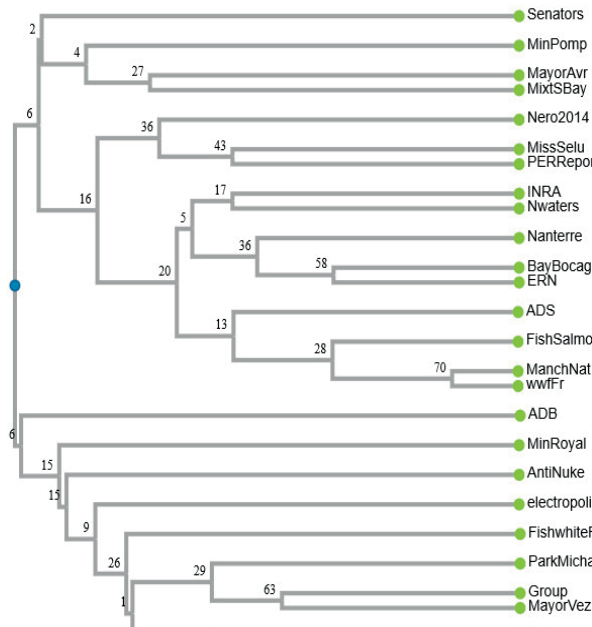
Cophenetic Correlation Coefficient (CP) = 0.910254360260512 **GRAPH 1 shows overall GOOD FIT**

Source: B.Kitous

2- Graphic Display 2 is based on Table G2: by comparison between actors (based on table 4 - technical risks) with bootstraps (/100%), the UPGMA method (26 rows with 15 variables in each row) results into a very different dendogram with less divide between actors. The sum of squares method has been used to compare between sets of variables. 100 bootstrap replicates have been generated.

Table G2. Technical verbal qualifiers (identical to Table A2)

ACTOR	2lakes	chemics	costs	piercing	eutroph	floods	HMWB	H-output	H-revenu	AngeMi	Length	S-quota	S-flows	THT	Nuclear
>ADB amis	operational	floodraught	costeffect	floodraught	costeffect	floodraught	economy	costeffect	economy	economy	operational	operational	operational	powerout	terror
>Amis de la	dambreak	chemical	economy	continuity	dambreak	economy	chemical	dambreak	economy	operational	continuity	operational	continuity	continuity	chemical
>AntiNuclé	powerout	continuity	economy	powerout	chemical	powerout	powerout	powerout	powerout	powerout	operational	operational	operational	powerout	powerout
>BaieBocag	continuity	continuity	costeffect	dambreak	dambreak	chemical	chemical	powerout	economy	chemical	operational	economy	economy	seismic	powerout
>CNRS-Uni	floodraught	chemical	economy	continuity	chemical	floodraught	powerout	economy	economy	operational	continuity	costeffect	economy	continuity	powerout
>Communit	operational	operational	operational	operational	chemical	floodraught	costeffect	costeffect	economy	economy	operational	economy	costeffect	powerout	terror
>Deputy ca	economy	economy	operational	economy	costeffect	floodraught	economy	costeffect	economy	economy	economy	economy	costeffect	powerout	terror
>ELECTRO	costeffect	costeffect	chemical	economy	costeffect	economy	operational	costeffect	operational	operational	continuity	economy	operational	powerout	terror
>ERN-SOS	continuity	continuity	economy	dambreak	dambreak	floodraught	chemical	dambreak	operational	chemical	continuity	continuity	economy	continuity	chemical
>Fishermer	continuity	chemical	dambreak	continuity	chemical	terror	dambreak	dambreak	economy	economy	continuity	costeffect	continuity	continuity	chemical
>FishingPo	chemical	chemical	operational	terror	chemical	terror	economy	operational	economy	economy	economy	costeffect	operational	continuity	powerout
>Group of ℓ	powerout	costeffect	costeffect	costeffect	costeffect	floodraught	costeffect	costeffect	economy	economy	economy	economy	operational	powerout	terror
>INRA Bagl	continuity	operational	continuity	dambreak	dambreak	floodraught	chemical	dambreak	continuity	operational	dambreak	costeffect	continuity	continuity	chemical
>Maire Avr	operational	chemical	costeffect	operational	chemical	economy	operational	powerout	operational	chemical	economy	economy	continuity	powerout	powerout
>Mairie Véz	economy	operational	costeffect	terror	chemical	terror	operational	costeffect	economy	economy	economy	costeffect	operational	powerout	terror
>Manche-N	economy	continuity	economy	dambreak	dambreak	dambreak	chemical	dambreak	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Mission S	dambreak	floodraught	continuity	dambreak	dambreak	floodraught	chemical	dambreak	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Minister/S	economy	costeffect	economy	floodraught	costeffect	floodraught	costeffect	costeffect	economy	economy	economy	economy	continuity	powerout	terror
>Biodiv.Por	continuity	chemical	continuity	dambreak	continuity	continuity	dambreak	dambreak	continuity	operational	dambreak	continity	continuity	continuity	chemical
>Mixt.Syndi	seismic	floodraught	costeffect	floodraught	dambreak	floodraught	chemical	operational	operational	economy	continuity	economy	continuity	powerout	powerout
>NERON er	continuity	dambreak	dambreak	continuity	dambreak	continuity	dambreak	dambreak	continuity	operational	continuity	costeffect	continuity	continuity	chemical
>NORMAN	continuity	dambreak	dambreak	continuity	dambreak	floodraught	chemical	continuity	continuity	operational	dambreak	continuity	continuity	continuity	chemical
>Parc Arch	economy	costeffect	costeffect	terror	costeffect	powerout	operational	costeffect	economy	economy	economy	economy	economy	powerout	terror
>PERRIN r	continuity	dambreak	dambreak	continuity	dambreak	dambreak	dambreak	dambreak	continuity	operational	dambreak	costeffect	continuity	continuity	chemical
>Senators	continuity	dambreak	dambreak	continuity	chemical	floodraught	dambreak	costeffect	economy	economy	economy	economy	costeffect	seismic	powerout
>WWF FRA	continuity	dambreak	economy	dambreak	dambreak	continuity	chemical	continuity	continuity	operational	dambreak	costeffect	continuity	continuity	chemical

GRAPH 2 shows overall AN EXCELLENT FIT WITH DATA

NEWICK FORMAT OF CLUSTERS/ (((((((ADB:0.358,Communi-ty:0.358):0.015,((Deputy:0.309,((ELECTROPOLI:0.278,Parc:0.278):0.011,(-Group:0.231,MinisterSRoyal:0.231):0.057) :0.021):0.046,Mairie:0.355):0.018):0.055,Senators:0.427):0.037,(BaieBocage:0.444,(Maire:0.420,Mixt-SyndicBay:0.420):0.024): 0.020):0.005,(CNRSUniv:0.420,FishingPond-s:0.420):0.050):0.011,AntiNuclear:0.481):0.008,((Amis:0.380,((((ERNSOS:0.231,Man-cheNature:0.231):0.044,(INRA:0.180,Mission:0.180):0.096):0.045,((NERON:0.124,PERRIN:0.124):0.142,(NORMANDY:0.231,WWF:0.231):0.035):0.054):0.016,BiodivPompili:0.336):0.043):0.020,Fishermen:0.399):0.089);

Cophenetic Correlation Coefficient (CP) = 0.936250018117282 => this gives a VERY GOOD fit.
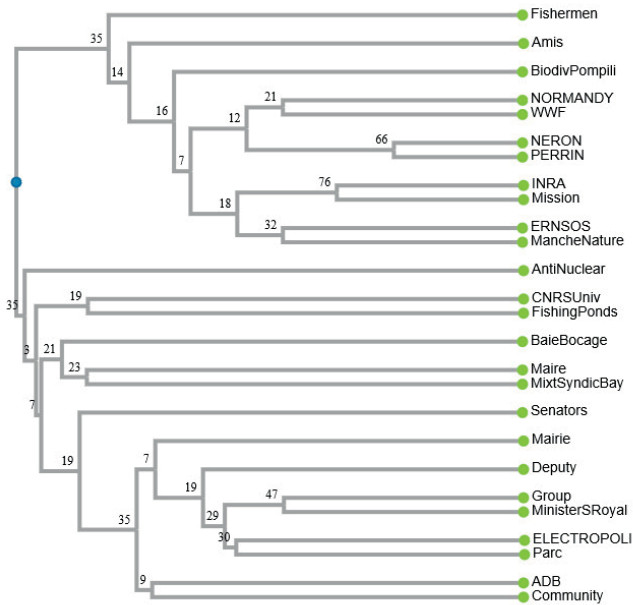
Discussion & conclusion: Conjuring tricks on HMWB (heavily modified water bodies) in France

The bureaucratic mania which Peyrefitte denounced thirty years ago as the "French disease" has been recreated in the Sélune saga with a soviet-like water policy, a blindness to strong distortions of reality, 23 years of conflict separating belligerents into two radical camps "for and against dams removal", at a direct cost estimated at between 55 and 90 million Euros, and an indirect risk of consequential losses of over 180 million. However, based on analysis of the Verbal Matrix results, this serious mess does not make mediation impossible; if shared, the method proves that with 26 actors (or more), it is possible to identify which dimensions are the best fit to see how

actors can share the river's multiple uses and come together in addressing risk-management issues cogently and with purpose. Instead of continuing along a path of bias and distortions due to leitmotiv group-think leading to an absurd mono-dimensional choice (the removal of dams and reservoirs at huge expense) based on forced dialogue ("absolute continuity" cyclical argument), Verbal Matrix allows to try several dimensions of finding a probable solution to the problem. Accepting that the worst case scenario is brooding over the "pros v cons" which prevents all actors (any actor) from working together with others, it is suggested to consider the rivers Sélune and Sey as a dual-water system enmeshed at the Bay Mont Saint-Michel. As a result, today the question of technical aids to salmon migrations should be seriously documented whereas neither the 'dam removal camp' nor the 'keep dam and reservoirs camp' work on such helpful technologies. Instead, one side declares *ab origino* "impossible to restore salmo salar migrations on the Sélune unless the dams are destroyed" leading to absurd triumph-of-the-will decisions, The Verbal Matrix method demonstrates that it is possible to empower actors at sharing common vocabularies with words respecting path-dependent "reasonable good-forms (Gestalt)".

Enabling conjugated ecological and economical solutions, the processing of Verbal Matrix gives results which are positive both quantitatively and qualitatively; as Graphs 1 & 2 show in particular:

– **Quantitative correlation coefficients** which are quite high (respectively 91% and 96%), associated to bootstraps tests confirming that strong clusters exist both among political players (actors) and among factors (facts or attributes), thus leading to reliable statistical assertions.
– **Qualitatively,** as one looks at clusters and trees displayed under dendogram formats, they present idiosyncrasies which illustrate the extreme mental and moral distances between actors, as well as the incredible confusion between separate issues which look like embedded confusions within the minds of the decision makers.
– Although the situation is very perilous because risks are not assessed altogether on an objective basis (underestimation of flood risks and related destruction costs, zero account of financial amortization nor nuclear hazards), one discovers possibilities of mediation over notions relating to technical risks.
– Actually, the split between actors is much less important when they share knowledge over the technology of risk-management than when each one claims removal of the dams as an "absolute" (solution or disaster). In here there exists a way to find agreements among almost all local actors; this discovery may help the process of conflicts to reach a solution of a shared and common agreement in terms of "do, train and teach";
– One may also understand why there has been a "waltz of prefects" in the Manche Prefecture since 1993, probably a record in France. Over 23 years,

the Manche district has seen 13 prefects appointed by the Ministry of Interior[1] in Paris; at the same time, locally one can observe the reproduction of the same elites for more than 50 years (for instance M. Thoury and M. Le-Grand are alumni of the same Saint-Lo Institute). Besides, there definitely exists a system of cash subsidies from the Water Agency and local politicians which creates shadowy pockets of profits paying for silence.

– When looking at the objectives expressed by the Water Agency, they are obsessively repetitive (continuity) instead of considering the variety of needs and actors which the river and its two reservoirs are serving.

– Graphic Displays 1 & 2 show results as relative positions of actors within and between clusters figured on tree-like dendograms which provides for two very different pictures of the actors' attitudes.

Synthesis comments from the observation of the two radically different dendograms:

1- Graph 1 shows the drama of having two parties at war after almost a quarter-century of misunderstandings, with a cutting line isolating 2 and only 2 clusters of determined actors:

(A) - maintain dams and reservoirs, a group with: the Mayor of Vezins, the Park Michel owners, Fishermen (coarse fish), Firm Electropoli, Minister S. Royal* (*Minister supposed to be the key political decision-maker)

(B) - remove dams and reservoirs, a nemesis group: ADS, Fishermen Salmo salar, Manche Nature, WWF, Bay Bocage water business, ERN European River Network, Nanterre University Ms. Germaine, INRA M. Bagliniere, Normandy Water Agency, Mission Sélune at Prefecture, PERRIN Report, NERON Committee, the Mayor of Avranches, Mixed Syndicate at Bay, under-Minister Pompili, and Senators Bas and Bizet.

Risks of social rupture and local "war" are therefore considerable.

2- Graph 2 shows a much more open prospect of agreement between (at least) local actors; when the technical dimension of risks is considered (see Table G2), then divisions between Actors are much less dramatic, and there is place for MEDIATION. This graphic representation brings some new light into the possibilities to reach shared solutions over the sustainable development of the Sélune basin, associating hydro-power with Biological and ecological continuities instead of entertaining more of the ideology of destruction which amounts to ignorance and confusion in people's minds. Actual chances to reach peace-agreements are enhanced.

By way of reasoning on Verbal matrices one discovers that, depending on what problem is raised and how words are chosen, the positions and attitudes of the 26 actors towards removal of the dams and reservoirs switch from fighting conflicts to opening the possibilities of moderation. This shows that mediation depends upon the method and vocabulary used, going beyond strictly legal matters to reach mutual

agreement over symbols. Finally, Boris Cyrulnik psychiatric advice might be right: "Redeem your vision and your words; life is expecting more of you".

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Glossary pursuant to Water Framework Directive, 2000/60/EC (these words are tracers of legal & actual issues dealt with Verbal matrices)

Anadromous: Refers to species that live in the ocean and ascend rivers to spawn (instance: Atlantic salmon *Salmo Salar*).

Artificial water body (AWB): Body of surface water which results from physical alterations by human activity.

Biological continuity: Capacity of an ecosystem to enable aquatic species, as well as species that live around water such as beavers and otters, to successfully undertake characteristic, species-specific migration behaviors.

Body of surface water: A discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water.

Bypass: A channel at a hydropower facility that circumvents the facility's turbines and allows for safe passage of fish migrating downstream in the underwater current at the facility dams and weirs.

Cost-benefit analysis: The evaluation of an investment project from the viewpoint of economy as a whole by comparing the effects of undertaking the project with not doing so. **Cost-effectiveness analysis:** Analysis of the costs of alternative programs designed to meet given objectives. Program costing least is most cost-effective.

Dam: Structure built across a stream, river, or estuary to retain water.

Environmental objectives: Means the objectives set out in Article 4 of the Water Framework Directive.

Eutrophication: Excessive enrichment of water by nutrients leading to an unduly abundant growth of algae.

Fish ladder: Technical construction with a series of steps with flowing water and pools enabling fish species to circumvent an obstruction such as a dam (upstream & downstream).

Good ecological potential: Status of a heavily modified or an artificial body of water, so classified according to Annex V of the Water Framework Directive.

Good ecological status: Status of a body of surface water, so classified according to Annex V of the Water Framework Directive.

Groynes/Louvres: Man-made boulders/grids designed to direct, control, screen flows of water/fish in a river.

Habitat: Area in which a specific animal (here: *salmo salar*) or plant species regularly occurs.

Heavily modified water body (HMWB): Body of surface water which as a result of physical alterations by human activity is substantially changed in character.

Hydrological continuum: Spatial, temporal & functional interrelationships within flowing waters.

Hydropower facility: Facility generating electricity by transforming energy in water to mechanical energy in a turbine that drives an electric generator.

Impoundment: Body of water confined by a dam, dike, floodgate or other barrier.

Mitigation measures: Measures to improve the status of the water body while keeping existing modifications for their intended specified uses (e.g. creation of habitat diversity within the constraints of banks profiling etc.).

Normandy Waters Agency (NWA): English translation to: Agence de l'Eau Seine-Normandie, direction territoriale & maritime des rivières de Basse-Normandie (headquartered in Rouen). NWA has Commission locale de l'eau (C.L.E) documenting local issues, preparing & voting SAGE (see below).

PTAP: plan territorial action prioritaire written & voted/NWA in Dec2012-Feb 2013= dams removal blueprint

Reservoir: A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

River Basin Management Plan: Plan to be produced for each River Basin District within a Member State in accordance with Article 13 WFD. The plan shall include the information detailed in Annex VII WFD.

SAGE: acronym designating River management policy (schema amenagement & gestion de l'eau), which is itself escalating up into the **SDAGE** (schema directeur amenagement & gestion de l'eau). Such paper piling creates a French Water Plan with distortions of all sorts to reality (including potential fraud), similar to the Soviet 1928-1953 Gosplan dysfunctions.

Salmo Salar: scientific name of the Atlantic salmon (rivers Sey and Sélune share the same European TAC along the same estuary at Bay of Mont-Saint-Michel, Normandy)

Spawning ground: Geographic area where shedding and fertilization of eggs takes place.

T.A.C : total allowances catch = European fishing quota; the *salmo salar* TAC is common to the rivers Sey-Sélune

WA: Water Agency (Agence de l'eau Seine-Normandie, also called NWA Normandy water agency)

Water Framework Directive 2000/60/EC: establishing Community action in the field of water policy. It aims to secure the ecological, quantitative and qualitative functions of water. It requires that all

impacts on water be analyzed & actions taken within river basin management plans, including **Good surface water chemical status.**

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1   From 1993 to 2017, thirteeen Prefets have been appointed to Manche Department making an average presence of 21 months on site. Here is their list in chronological order :MM.Landrieux, Kilian, Convert, Pommies, Gregoire, Desforges, Fargeas, Charbonniaud, Laflaquiere, Colrat, Ms Polvé-Montasson, MM.Witkowski, Sabathé.