



SOCIOECOLOGICAL SYSTEMS ANALYSIS (SES):

Lessons from the Venezuelan Oil Industry Applied to Fisheries in Venezuela and Chile

Héctor Trujillo², J.L. Fuentes¹, E. Trujillo³, J. C. Rodríguez¹

¹ Centro Regional de Investigaciones Ambientales (CRIA), Universidad de Oriente, Nueva Esparta Apartado Postal 147, Porlamar, Venezuela fuentes@ne.uo.edu.ve

² Consultor Asociado al CRIA, Porlamar, Venezuela https://ambientes@cantv.net

³ Instituto Investigaciones Científicas, Universidad de Oriente, Núcleo de Nueva Esparta Apartado 147, Porlamar, Venezuela trujillo@ne.uo.edu.ve

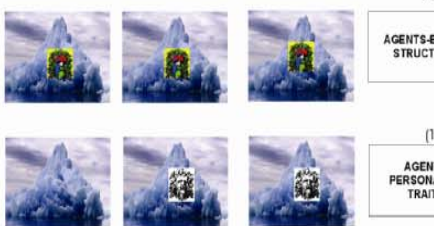
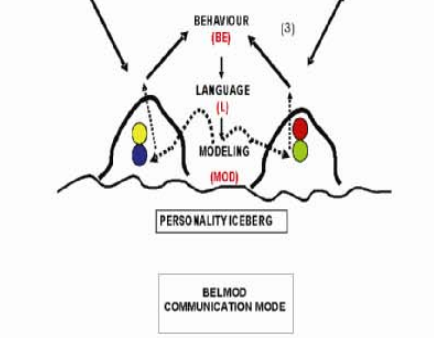
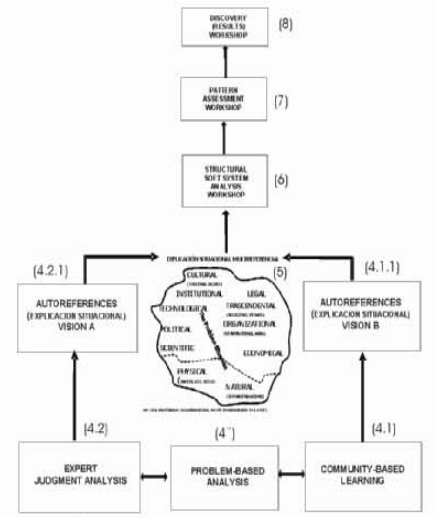


INTRODUCTION

SOCIOECOLOGICAL SYSTEMS ANALYSIS AS A BOTTOM UP INDUCTIVE PROCESS OF LEARNING AND DISCOVERY (BU/PLED) STARTED IN THE VENEZUELAN OIL INDUSTRY IN 1978-1980 WITH TWO STARS PROGRAMS: ONE FOR EXPLORATORY DRILLING FOR OIL AND GAS ALONG THE COAST FROM DELTA DEL ORINOCO RIVER TO NORTH OF PENINSULA DE PARIA. THE OTHER, TO DEVELOP ONE OF THE FOUR BIGGEST TAR SANDS OF THE WORLD KNOWN AS THE ORINOCO HEAVY OIL BELT <http://xelar.google.com.ua/scholar?hl=es&as4=6&ui=221471350108260977>.

THESE PROJECT'S ENVIRONMENTAL IMPACT ASSESSMENT GAVE THE OPPORTUNITY TO START LEARNING HOW TO COPE WITH THE MULTIPLE INTERACTIONS BETWEEN TERRESTRIAL, ESTUARINE, AND MARINE ECOSYSTEMS AND THE HUMAN SYSTEM AS WELL. LESSONS CONTINUED UNTIL 2002 WHEN UNIVERSIDAD DE ORIENTE IN VENEZUELA DECIDED TO USE THE (BU/PLED) APPROACH TO STUDY MORTALITY IN THE SARDINE FISHERY. LATER IN 2005 PONTIFICIA UNIVERSIDAD CATOLICA DE VALPARAISO, CHILE USED THE FORMER APPROACH TO STUDY 31 FISHERIES RESOURCES.

METHODOLOGY



- THE (BU/PLED) METHODOLOGICAL APPROACH CAN BE SUMMARIZED IN 8 STEPS AS FOLLOWS:
- 1) IDENTIFY AGENTS PERSONALITY TRAITS (APT) (1) INVOLVED IN THE PROJECT THEN.
 - 2) USE PRIMARY AND SECONDARY TRAITS TO DESIGN THE AGENTS-BASED STRUCTURE (2). THIS WILL ALLOW ESTABLISHING THE (BELMOD) COMMUNICATION MODE (3) AMONG PROJECT PARTICIPANTS. NEXT.
 - 3) PRACTICE BELMOD TO PRODUCE GENERATIVE LEARNING WHILE DEALING WITH PROBLEM-BASED ANALYSIS (4) OF THE SOCIOECOLOGICAL SYSTEM (5) IDENTIFIED A PRIORI. THEN.
 - 4) USE BELMOD TO STIMULATE COMMUNITY-BASED LEARNING (4.1) TO PRODUCE FIRST-ORDER LEARNING BY WHICH AGENTS BRINGS FORTH A WORLD (4.1.1). NEXT, USE BELMOD TO STIMULATE EXPERT JUDGMENT ANALYSIS (4.2) TO PRODUCE FIRST-ORDER LEARNING BY WHICH AGENTS BRINGS FORTH A WORLD (4.2.1). NEXT STEP.
 - 5) USE AUTOREFERENCES (4.1.1 AND 4.2.1) TO GENERATE SECOND-ORDER LEARNING TO PRODUCE A UNIFIED VISION OF THE PROBLEMATIC SITUATION (5). THIS AS A MULTIREPRESENTATIONAL EXPLANATION OF REALITY NEEDS TO BE ANALYZED AS A WHOLE AT THIS POINT.
 - 6) CARRY OUT A WORKSHOP (6) TO PERFORM STRUCTURAL, SOFT SYSTEM ANALYSIS OF THE PROBLEMATIC SITUATION (5). IDENTIFY KEY-PROBLEMS IN THE SOCIOECOLOGICAL COMPLEX ADAPTIVE SYSTEM (CAS). THEN.
 - 7) CARRY OUT A WORKSHOP (7) TO ASSES KEY-PROBLEMS AFFINITY AND ESTABLISH PATTERNS AND FINALLY.
 - 8) CARRY OUT A WORKSHOP (8) TO CONSOLIDATE DISCOVERIES ENCOUNTERED AND SHOW RESULTS

DISCOVERY

AND

LEARNING

OF

PROCESS

INDUCTIVE

UP

BOTTOM

START

SOME RESULTS

CHILE

PRIMARY AND SECONDARY TRAITS: AGENTS-BASED STRUCTURE

AGENT	PRIMARY	SECONDARY
Y.T	Red	Green
A.G	Red	Green
L.F	Red	Green
G.E	Red	Green
T.H	Red	Green
H.S	Red	Green
O.A	Red	Green
P.M	Red	Green
C.L	Red	Green

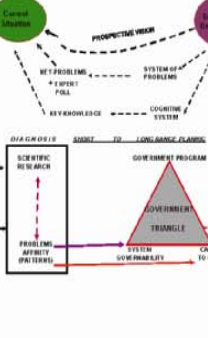
Reference: Fondo de Investigación Pesquera. 2007. Diagnóstico del Estado del Conocimiento de los Principales Recursos Pesqueros en Chile. Informe Final Proyecto FIP 2005-25. See [www.p.flo.cl](http://p.flo.cl)

IN THIS PROJECT 40 SPECIALISTS FROM DIVERSE FIELDS OF WORK AND INSTITUTIONS PARTICIPATED IN VARIOUS MEETINGS AND WORKSHOPS. ALL PARTICIPANTS WERE ASKED TO FILL OUT A QUESTIONNAIRE TO IDENTIFY THEIR PATTERNS OF ACTION AND ATTITUDE. THE PURPOSE OF THIS REQUEST WAS TO HAVE INDIVIDUAL PERSONALITY PORTRAITS TO ARRANGE SMALL AND LARGE GROUPS'S STRUCTURE TO FACILITATE INTERACTIONS WITHIN GROUPS AMONG THEM.

EACH SPECIALIST USED AN IDENTIFICATION BADGE WITH HIS NAME AND PRIMARY-SECONDARY TRAITS SO EVERYONE COULD BE AWARE OF OTHER SPECIALIST'S PERSONALITY. THE STRUCTURE OF THE EXPERT SMALL GROUP OF 9 PEOPLE WHO LEAD THE PROJECT IS PRESENTED HERE AS AN EXAMPLE. THE GRAPHIC SHOWS THE GROUP DOMINANT FUNCTION (RED) SUPPORTED BY THE AUXILIARY FUNCTION (GREEN AND YELLOW). THIS MEANS THE GROUP WAS FAST Paced AND TASK ORIENTED, STRONG-WILLED, DECISIVE, EFFICIENT, INDEPENDENT AND PRACTICAL ON ONE SIDE BUT ON THE OTHER, PUSHY, DOMINEERING, TOUGH AND HARSH. IN THIS CASE, THE GROUP OF OTHERS' BEHAVIORAL STYLE WAS ACKNOWLEDGED IT WAS MUCH EASIER TO INDUCE COLLABORATION, UNDERSTANDING AND LISTENING TO EACH OTHER. IT ALSO PROVIDED A PSYCHOLOGICAL MECHANISM TO AVOID ENDLESS DISCOURSES THAT GENERATE GROUP ENTROPY.

SIMILARLY DURING WORKSHOPS THE LARGE GROUP OF SCIENTIST WAS DIVIDED INTO SMALL GROUPS OF 6 PEOPLE ACCORDING WITH THEIR PERSONALITY. THEY WERE EXPLAINED THE MEANING OF COLORS (RED-YELLOW-GREEN AND BLUE) SO THEY COULD RECOGNIZE THE DIFFERENT TYPOLOGIES THEY HAVE IN FRONT AND START BUILDING RAPPORT WITH EVERY ONE. YOUR COMMUNICATION IS ONLY AS GOOD AS YOUR UNDERSTANDING OF THE PERSON YOU'RE COMMUNICATING WITH.

FIGURE 1 EMPHASIZES THE ROLE OF THE GOVERNMENT TRIANGLE AS THE TRIAD CONDITIONIC FISHERIES SUSTAINABILITY



THE MAIN OBJECTIVE OF PROJECT FIP 2005-25 WAS TO DIAGNOSE THE CURRENT STATE OF KNOWLEDGE OF 31 FISHERY RESOURCES TO PROPOSE A RESEARCH-PROGRAM (RP) FOR FISHERIES SUSTAINABLE DEVELOPMENT (FSD). HOWEVER, SINCE SUSTAINABILITY IS A CONFLICTING ISSUE IT WAS DEEMED NECESSARY TO EXPLORE DIMENSIONS OTHER THAN KNOWLEDGE TO ASCERTAIN HOW VIABLE WOULD BE (RP). A GROUP OF TEN DECISION AND POLICYMAKER PEOPLE WERE ASKED TO IDENTIFY PROBLEMS THAT WOULD PRECLUDE REACHING SUSTAINABILITY OF THOSE FISHERIES. 30 PROBLEMS WERE IDENTIFIED AND ANALYZED AS A SYSTEM. 12 OF THEM EMERGED AS CORE KEY-PROBLEMS (DRIVERS) AND THEIR AFFINITY MADE POSSIBLE TO DISCOVER TWO PATTERNS THAT ARE CONCRETE EXPRESSIONS OF GOVERNABILITY.

PATTERN 1: The Global Organization of the Fisheries Sector, characterized by Problem No (17): Incomplete Institutional Structure. Problem No (15): Lack of Personnel in Government Organizations. Problem No (13): Lack of Connectivity among Government Organizations.

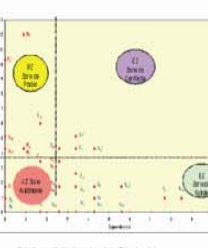
PATTERN 2: The Institutional Relationship in the Fisheries Sector characterized by Problem No (24): Lack of fluid relationship between Government Authorities and Artisanal Fishermen. Problem No (30): Lack of political will and/or management capacity to empower existing artisanal fisheries policies. Problem No (7): Lack of Knowledge regarding the Cultural and Social Topology of the Fisheries Sector. Problem No (8): Lack of Diagnosis concerning the different types of fisherman organizations and actors involved.

THE RESEARCH PROGRAMME AS SHOWN IN FIGURE 1 IS LINKED THROUGH GOVERNABILITY TO THE GOVERNMENT TRIANGLE. THIS IS THE DOMINION WHERE FISHERIES POLICYMAKERS DESIGNED GOVERNABILITY AS AN EMERGENT ISSUE IN THE STUDY PROJECT LINKED BOTH TO THE CAPACITY TO GOVERN AND THE GOVERNMENT PROGRAM. THIS IS THE TRIAD CONSTRUCTING AND GENERATING VIABILITY TO SUSTAINABLE DEVELOPMENT AND RESEARCH SUPPORTING IT. FISHERIES AUTHORITIES WERE EARLY ADVISED WHERE TO EMPHASIZE RESEARCH AND FOCUS TO GENERATE VIABLE TECHNICAL DECISIONS FOR (FSD). IN THE LONG RUN PLANNING DESPITE THE EXCELLENCE OF THE RESEARCH PROGRAM, SUSTAINABILITY OF FISHERIES RESOURCES COULD BE INCORPORATED BY INADEQUATE POLITICAL DECISIONS TO UNVEIL AND SORT POLITICAL CONSTRAINTS TO SUPPORT PROBLEM ORIENTED RESEARCH A COMMUNICATION MODE SUCH AS BELMOD MIGHT HELP STIMULATING A BOTTOM UP INDUCTIVE PROCESS OF LEARNING AND DISCOVERY.

DR. YBHEZEL 1988 POLICYMAKING UNDER ADVISORY TRANSACTION BOOKS. MATUS, CARLOS. PLANIFICACION Y GOBIERNO (EN) PLANIFICACION AMBIENTAL, una Vision de Conjunta eds JM Aguilera y H. Trujillo. Publicación Especial, Universidad Simon Bolivar (USB) LAGOVENS A 1987

VENEZUELA

Figure 2. Key - Problems Identification



REFERENCE: Fuentes, J.L., H. Trujillo y E. Trujillo. 2005. Analisis de Sistemas Socioecologicos: aplicación al estudio de las mortandades de Sardineles surta en Isla Margarita, Venezuela. XI Congreso Latinoamericano de Ciencias del Mar, Mayo 2005. Villa del Mar, Chile.

FREQUENT SARDINE MORTALITY ALONG MARGARITA ISLAND'S SHORES, VENEZUELA, MOTIVATED THE CENTRO REGIONAL DE INVESTIGACIONES AMBIENTALES (CRIA), NUCLEO NUEVA ESPARTA, UNIVERSIDAD DE ORIENTE, TO UNDERTAKE AT THE BEGINNING OF 2002 A RESEARCH PROJECT TO STUDY THE OCCURRENCE OF SARDINE MASS MORTALITY. FROM AN ECOLOGICAL AND SOCIAL VIEWPOINT, ECOSYSTEMS, TECHNICAL, POLITICAL, SAFETY, HEALTH AND ENVIRONMENT, AT THE SAME TIME WAS NECESSARY TO FIND OUT POSSIBLE CAUSES OF MASS MORTALITY AND THEIR SOLUTIONS. PROJECT'S RESULTS POINTED OUT THAT: 1) SARDINE MORTALITY IS MUCH MORE THAN A BIOLOGICAL PHENOMENON EMBEDDED IN THE SOCIAL AND ECOLOGICAL SYSTEM CONTEXT 2) IDENTIFYING THE SYSTEM KEY-PROBLEMS (SEE FIGURE 1) AND SELECTING THE MOST IMPORTANT ONES ACCORDING WITH THEIR DRIVING FORCE IN THE SYSTEM ALLOWS DECISION AND POLICYMAKERS TO TACKLE ROOT PROBLEMS. 3) AFFINITY OF KEY-VARIABLES PROBLEMS ALLOWS TO IDENTIFY CLUSTERS FOR TAKING ACTION AND COPE WITH DIFFERENT ISSUES SUCH AS: LEGAL ONES, FISHERY TECHNOLOGICAL AND STRUCTURAL CONSTRAINTS, POLLUTION ABATEMENT, USE OF THE COASTAL ZONE, CONFLICT OF USE AND SPACE ARRANGEMENT (SEE TABLE 1).

THE OVERALL CONCLUSION WAS: SARDINELLA AURITA MASS MORTALITY ALONG THE SHORES OCCURS MAINLY DUE TO MULTIPLE INTERACTIONS FOR SPACE COMPETITION AMONG USERS OF THE COASTAL ZONE: FISHERMEN, TOURISM, INFRASTRUCTURE BUILDING, WASTE DISPOSAL, MARINE SPORTS ACTIVITIES IN AN INADEQUATE LEGISLATION.

SOLUTION: TO ENFORCE A COASTAL MANAGEMENT PLAN.

CONCLUDING REMARKS

1. The Venezuelan Oil industry started in 1978 and 1980 the Environmental Impact Assessment (EIA) of two Star- Programs: one for exploratory drilling for oil and gas along the coast and the other to develop the Orinoco Heavy Oil Belt <http://xelar.google.com.ua/scholar?hl=es&as4=6&ui=221471350108260977>. Both initiatives had the potential of heavy impact on terrestrial, estuarine and marine ecosystems and the human system as well. The Venezuelan Oil industry, with a long history of strong Corporate Culture, had to create the tools to learn to speak the language of EIA studies to communicate with people in general, scholars and scientists. Similarly, institutions in charge of EIA studies had to learn to speak the language of EIA. This convergent starting point initiated a bottom up inductive process of learning and discovery (BU/PLED). It was a step-by-step process that lasted 20 years and still continues. At the end, lessons learned taught 'How to do things with why'.
2. To day is much easier than before a) to structure high performance teams; b) to manage and coordinate large groups interactions; c) to deal with group entropy; d) to induce and motivate listening; e) to create understanding and collaboration among scientists from diverse disciplines; f) to practice transdisciplinary; g) to identify governance problems; and finally, the great grand lesson h) to do unto others as they'd like done unto them. That means learning to understand other people in ways that are best for them not just for us. In other words, figure out the people around us and then adjust our behavior to make them more at ease and make them more comfortable. The Corollary of this was a process named BELMOD designed to upgrade conversations based on human behavior, ontological coaching (language) and NLP.
4. Recently BU/PLED fishery applications have been highly successful opening up space to start applying the ecosystem approach to fisheries (EAF) within the context of SESs

Trujillo, H. 1998. Planificación Estratégica del Ambiente: nuevo enfoque para la Evaluación del Impacto Ambiental y Resolución de Problemas. En: Planificación, Tecnología y Ambiente (ed. H. Trujillo) M. Aguilera. Publicación Especial. Generación Protección Integral. División de Oriente. Lagovens A. BELMOD Behavioral, Language and Modeling. NLP: Neuro-linguistic programming.