

Analysis of Human-Elephant Conflict in Sri-Lanka by The Win-Win-Win Papakonstantinidis Model

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ABSTRACT

Asian Elephants have been revered for centuries and playing an important role in the continent's culture and religion where they habitat. Sri Lanka plays an important role in Asian elephant conservation in accommodating more than 10% of the global Asian elephant population in less than 2% of global Asian elephant range. Human - Elephant conflict (HEC) is a significant component in Socio - economic development in Sri Lanka and conservation of free range elephants. In this study we attempted to Analysis Human-elephant conflict in Sri-Lanka using the win-win-win Papakonstantinidis model.

Keywords:

Asian Elephants, Human - Elephant Conflict, Wildlife Management, Wildlife Conservation, Economic development

INTRODUCTION

Asian Elephants have been revered for centuries and playing an important role in the continent's culture and religion where they habitat. They are also play an important role in maintaining the region's forests (WWF, 2017). Asian Elephants (*Elephas maximus*) are listed as 'Endangered species' and recorded in isolated populations in 14 states. Their mean population was estimated at 43,445 individuals. Asian elephant population size has reduced to be at least 50% over the last three generations due to reduction of quantity and quality of habitat and limited to a very approximate total home range of 486,800 km². (IUCN, 2008; Fernando and Pastorini, 2011).

Sri Lanka plays an important role in Asian elephant conservation in accommodating more than 10% of the global Asian elephant population in less than 2% of global Asian elephant range (Leimgruber et al., 2003; Fernando and Pastorini, 2011). Sri Lanka also has one of the highest human densities among range countries (Fernando and Pastorini, 2011). The wild elephant population in Sri Lanka was estimated at 5879 in 2011 (DWC, 2013). The major threat to elephants in Sri Lanka is habitat loss and fragmentation through conversion to human settlements and permanent cultivation and the ensuing human-elephant conflict (HEC). Habitat loss continues to occur at an ever increasing pace especially with the drive for post war 'development', fueling HEC. Elephants are currently found over almost the entire dry zone in an area approximately 60% of the island and HEC occurs over most of elephant range (Fernando et al., 2011).

The agency mainly responsible for mitigating HEC is the Department of Wildlife Conservation (DWC). The main methods used in mitigating HEC are crop guarding, chasing elephants from the vicinity of crop fields and villages, elephant drives, capture translocation and electric fencing (Fernando, 2006; Fernando et al., 2008). However, these mitigation measures did not show adequate success and the HEC is increasing day by day up to serious socio-economic problem (Prakash, 2014). In this study we attempted to Analysis Human-elephant conflict in Sri-Lanka using the win-win-win Papakonstantinidis model. We have taken into consideration that human's deaths interact with the elephants' deaths; a "game" (interaction) is raised, with the "conflict payoffs" for both parts. Our research, in this point is focused on building the "possibility" to "find" the equilibrium point, taking into account that human rationality is "balanced" with the elephants' natural power and their un-expected behavior.

METHODS

Human and elephant deaths, human injuries, and property damages in the six wildlife administrative regions over the ten year period of 2006 - 2015 were extracted from the Annual Performance reports of the DWC (DWC, 2015). Our main approach¹, intends to prove that the "Environmental Protection" is combined with "social welfare"² and social behavior, in terms of sensitization in a well-defined convex area can coexist with the capitalist economic model based on a "tri-polar" (instead of bipolar) perception of any interaction between people-elephants including the

1. all colleagues took part in the research that was conducted, gathered and worked the material that gathered ; all these required hard scientific work

2. Papakonstantinidis LA (2010) "Socio-sustainable Development, ION Ed 2010

Community (The Intermediate Community- the "C" factor), in 3D space, with the community as "rainbow" synthesis/analysis It is the "rainbow concept"³. Finally, at the same time we try to find if and when the proposed methodological tool, the "win-win-win Papakonstantinidis model" is applied in the big data⁴.

Historical View

This analysis will go further as an alternative, game/bargaining analysis' expression. As technology go on with faster "jumps" from the one point to the other, at the same time, human, economic, social, and psycho relations are changed faster and faster. Especially, the capital socio-economic system dominated on the others during the industrialization, 18th century, (and recently on the communism, 20th century). In the field of socio-economic relations, was noted a double trend: Leaving the Classical Economic School with the "morality" in focus"(Adam Smith, David Ricardo, Carl Marx, John Stuart Mill it passed in the New-Classical, [focusing on short-term equilibrium"] (Alfred Marshal, Leon Walras, John Hicks, and Alle) Neoclassical economics is an approach to economics focusing on the determination of goods, outputs, and income distributions in markets through supply and demand Marginal Economics can be the result of this. As the new-classical economic school was "ready" to be overcome, a new theory has been arisen as a "theory of everything" the game theory and its bargai-

ning problem. On this bargaining problem our approach - tabled on Visby University Gotland SW at the 2002-14-08 session -as an extension of «Nash Equilibrium» (NE) was treated, taking into account the community as the third part of a bargain/ any bargain between two. As it will be presented below, the global "trend" today is rather the convergence toward new ethical values, i.e. participatory democracy, social cooperative enterprises, social economy, the third pole of the economy, green growth, local development, natural environment etc.

ANALYSIS

On this point, a bargaining approach is introduced, in order to study the "human-elephants conflict" as a "game", or even as a "bargain" with its Equilibrium Solution (Nash, 1950). The innovative concept here is that the human have the most weight of responsibility, as elephants follow only their instinct and nothing more. From this point of view, a brief note to the win-win-win Papakonstantinidis bargaining approach is needed.

According to Papakonstantinidis (2003, 2004a, 2004b, 2007), the conditions describing the bargaining situations of the win-win-win papakonstantinidis model are as follows:

1. In a bargaining situation, there are two distinguishable entities with opposite expectations and opposite interests.

3. Papakonstantinidis L.A (2016) the "Rainbow Concept": "Social Welfare" Part of the Book, Dardanos Ed.

4. Big data is data sets that are so voluminous and complex that traditional data processing application software are inadequate to deal with them. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating and information privacy. There are three dimensions to big data known as Volume, Variety and Velocity. Lately, the term «big data» tends to refer to the use of predictive analytics, user behavior analytics, or certain other advanced data analytics methods that extract value from data, and seldom to a particular size of data set. «There is little doubt that the quantities of data now available are indeed large, but that's not the most relevant characteristic of this new data ecosystem.»Analysis of data sets can find new correlations to «spot business trends, prevent diseases, combat crime and so on.» Scientists, business executives, practitioners of medicine, advertising and governments alike regularly meet difficulties with large data-sets in areas including Internet search, fintech, urban informatics, and business informatics. Scientists encounter limitations in e-Science work, including meteorology, genomics, connectomics, complex physics simulations, biology and environmental research (wiki)

2. These distinguishable entities, with the precisely opposite expectations, should be motivated (for individual benefit), so that they are activated and they transform the opposite expectations in opposite interests and from there in opposite “strategies of victory, or sovereignty”.
3. Since we accept the existence of the “distinguishable entity” and the motive of individual profit, we must accept the following condition: the mistrust of each pole of the bargaining situation, regarding the intentions of other. Two distinguishable entities have different expectations; otherwise, the expectation of each one would be identified with the expectation of other.
4. The natural tendency of individuals to improve continuously their position, results as basic consequence of the above assumptions, but simultaneously recommends the reason for all above. This natural tendency is permanent. It does not have upper barrier, while on the contrary it has a lower one.
5. Tendency to conflict, which refers to the tendency to competition between the two parts of the bargain with different expectations and controversial interests, results from the combination of: a) the case of the distinguishable entity, b) mistrust of each distinguishable entity and c) tendency to improvement.
6. Tendency to sovereignty, which refers to the reason for which it is repeated, is in order to stress the importance of “need” for sovereignty, which finally “shapes” the expectations.
7. The strategic choice, the decision and the strategic plan: If all the above aim to achieve the strategic goal of sovereignty, then the strategic plan is the means for accomplishing such a goal.
8. The respect of each one of the two poles, in the rationalism of the other, without moral or other extensions. This is essential and necessary condition for the establishment of the bargaining (in opposite case, there is no negotiation, but simply a “sovereignty” of the one pole to the other). Each one from the two opposite poles just simply respects the “bargaining power of the other”, or the “rationalism of the other”, which is about “a better organized strategic plan for the achievement of sovereignty”.
9. The two “opposite” poles are involved in a bargaining situation through the STRICT choices (that have resulted from rationalism and strategies for sovereignty that shape their final decisions), they never regret for their choices and for their final decisions.

One of the applications of the win-win-win Papakonstantinidis model (since 2002/14/08) is an innovative concept of including a third part, the community (as a total of Values, traditions, ethos) in their conflict relations, between human-elephants. The procedure followed this concept, is the so-called “sensitization” Transferring a two-pole conflict relation in a three-pole, it is expected to be created a more harmonic and balanced human-elephants relation. This concept defines also the borders between human actions and elephants’ instinct reaction. At any case a short description of the bargaining problem and its win-win-win perspective with its math prove is needed.

The bargaining problem is a “share problem, not a binomial term⁵”

From this point of view, “payoffs” are the incentives, for which 2 bargainers start negotiations. The final [agreement or not agreement] are the outcome. In this proposed method, we recognize that “When two negotiators pushed by expected payoffs

Proposal: win-win-win/ utility max

Share A (%)	Share B (%)	Utility A	Utility B	Utility AXB	Share C (%)	Utility C	Utility AXBXC
90	4	1	71	71	6	1	71
80	13	2	70	140	7	2	280
70	22	5	68	340	8	3	1020
60	31	10	64	640	9	4	2560
50	40	16	60	960	10	5	4800 max
41	50	23	52	1196	9	4	4784
32	60	31	40	1240	8	3	3720
23	70	40	24	960	7	2	1920
14	80	50	12	600	6	1	600

CONCLUSION

Elephants, in Sri-Lanka, are not only a tourist attractive pole, but even more a factor of Nature-human EQUILIBRIUM. Elephants by their activities may influence our behavior for them may influence the way of thinking, our food priorities, through the dynamical, non-linear systems. Relations between human and elephants will continue to be a conflict; if human have not a reference point, except their own selfish. Instead of, human

must create in their mind the “natural environmental sensitization” as a third (3rd) fantastic part in a “bargain between 2” (human and elephants). North western WAR consists of unique conservation problem with regard to free range elephants. Unlike all other WARs of Sri Lanka, this region has the lowest coverage of Wildlife protected areas. Except Wilpattu National Park, the total extent of all the other wildlife protected areas in this region sizes less than 31,000ha.

⁵ In this term, scientists (rontos and alle) have not right, as they try to solve it, by probabilities bargaining problem is a mainly a sharing problem

$$U_A, U_B, U_C$$

when

$$U_A = x$$

$$U_B = y$$

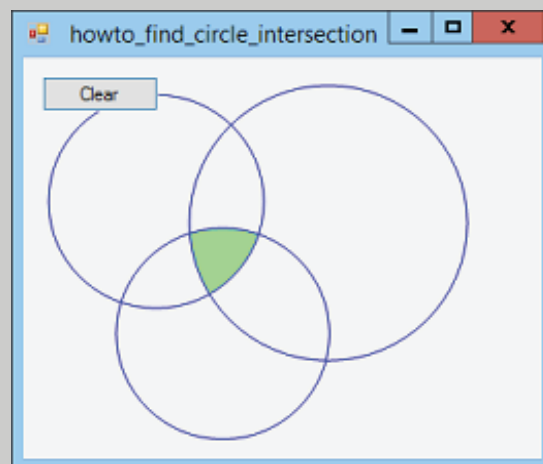
$$U_C = (100 - x - y)$$

$$U_A \cap U_B \cap U_C = U_A \times U_B \times U_C = MAX \Leftrightarrow (U_A \times U_B \times U_C)' = 0$$

$$x(100 - x - y)^n = MAX \Leftrightarrow [x(100 - x - y)^n]' = 0$$

generally,

$$(f(x) * g(x))' = f'(x) * g(x) + f(x) * g''(x)$$



But,

$$U_A \cap U_B \cap U_C = U_A * U_B * U_C = \max$$

$$(U_A * U_B * U_C)' = 0$$

$$u_i = f_i(z)$$

$$xy(100-x-y)^n = \max \rightarrow [xy(100-x-y)^n]' = 0$$

$$[xy(100-x-y)^n]' = x'y(100-x-y)^n + xy'(100-x-y)^n = xy[(100-x-y)^n]' = 0$$

$$xy(100-x-y)^n]' = y(100-x-y)^n + x(100-x-y)^n + nxy(100-x-y)^{n-1} = 0$$

$$(f(x) * g(x))' = f'(x) * g(x) + f(x) * g'(x)$$

$$[xy(100-x-y)^n]' =$$

$$y(100-x-y)^{n-1}(100-x-y) + x(100-x-y)^{n-1}(100-x-y) + nxy(100-x-y)^{n-1} = 0$$

$$\text{It must: } xy(100-x-y)^n = \max \rightarrow \lim_{x \rightarrow 0} [xy(100-x-y)^n] = 0$$

$$\text{sup that } (100-x-y) \neq 0$$

$$y(100-x-y) + x(100-x-y) + nxy = 0$$

$$(x+y)(100-x-y) + nxy = 0 \Rightarrow \left(\frac{x+y}{xy} \right) (100-x-y) = (-1)n \text{ by putting } \frac{x+y}{xy} = \lambda \neq 0$$

$$\lambda(100-x-y) = (-1)n \Rightarrow (100-x-y) = \frac{-n}{\lambda} = (-n) \frac{1}{\lambda}$$

$$\text{but } (100-x-y) = \% \text{ Community's share of a budget } b=1 \text{ EXPECTED payoff from } b=\Gamma$$

$$\% \text{ Community share} = (-n) \frac{1}{\lambda} (b) \text{ the } (-n) \text{ denotes the reduction}$$

result which comes from the Community's reaction in any BARGAIN (by its 3rd role, it is

as an Agent of the CITIZEN-PRINCIPAL relation Arbitrator, and as the

Independent 3rd party) to the total budget "b" of the BARGAIN

then, the i^{th} player's best mixed strategy (probability) is a lottery over

a trinomial distribution, is the best strategies for himself, as well as the best STRATEGIES

for the other players, as well as the best strategy

for the Community (the common welfare)

notes :

A,B,C...do,,,not...cooperate..forward

A,B,C..must..collaborate..in..and..during..the..b argain..(ins tant..reflection..winning..strategies)

"C"...expresses...not...only..the..rest..(no..b argain..participants),,but...also..the..total..community..the..word cultural...heritage,world...cultivation...the.."human...being"... "Homo...Sapiens"

From...this..po int..of..view,...Community...participation..in..any..b argain...between..TWO(2)..is..necessary

Also,..COMMUNITY – the.."c"..factor..MUST...express..the.."Community..Fear"..from..the..b argain,..between..A,B

For..this.."Community..participation"..is..captured..as...(100 – x – y)" ,where..n = the..fear..factor..(nonlinear),while..

the..A,B..utility..functions...must..be..linear

$$\lambda_1 = 1, x * \% = \frac{n}{1} \% = 100\% = \max(\text{quite..inequality..and..unjustice..in..distribution...of..A,B,and..Community})$$

$$\lambda_2 = 2...x * \% = \frac{n}{2} \% = 50 - 50 - 0$$

$$\lambda_3 = 3...x * \% = \frac{n}{3} \% = 33,3333...IDEAL...SITUATION$$

$$\lambda_{4+} = 4 +x * \% = \frac{x}{4+} \% = UNSTABLE.(THEOCHARIS – OSCILLATION) ...of..A,B,C..expectations$$

Let

H as the upper – right boundary of P

Obviously, $H \subset P$, is the efficient frontier of P

Let $t = (t_1, t_2) \in P$ be the vector of disagreement payoffs of person 1

and

person 2, respectively, $t_i (i = 1, 2, \dots) \in P$ being the payoff that person i

gets, if the parties fail to agree

Let $P^ = \{u \in P : u_1 \geq t_1, u_2 \geq t_2\}$ clearly, $P^* \subseteq P$*

It is assumed, that t is fixed, i.e t_1 and t_2 are DETERMINED By the rules of the game

Let H^ denote the upper – ghrite boundary of P^* Thus, $H^* \subseteq P$*

The BARGAINING, PROBLEM is, then:

" Given P and t, what will be the solution $\bar{u} = (\bar{u}_1, \bar{u}_2)$ that the bargaining

parties will eventually reach, ASSUMING all individuals act rationally?

e

Is the point satisfying, the

$$(\bar{u}_1 - t_1)(\bar{u}_2 - t_2) = \max_{u \in P} [(u_1 - t_1)(u_2 - t_2)]$$

such that,

$$u_i \geq t_i, i = 1, 2$$

Elephant drives may also cause increase in HEC by making elephants more aggressive. Most bull elephants, who are the main crop raiders, either return to where they have been driven from, or avoid being driven. The Government of Sri Lanka must take measures to ensure the survival of elephants, the country's «treasure» Although the elephant-human relationship seems to be competitive, conflicting, only the human race can reason, take measures to protect them, enact policies to impose policies to protect the natural environment. In any case, the proposed

solution, in the context of «the win-win-win Papakonstantinidis model», has its significance only if it can sensitize the population, local and tourists in this direction. In a re-active perspective, human kind has the first role: In fact the re-active perspective has a low importance, as people have to decide. From the other hand, according to Lorenz'(1972) «butterfly effect» as the , micro-systems' balance may be influenced such as to cause huge spiral destroys. ◀

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