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Paradigm Evolution and Sustainability Thinking: Using a Sustainability Inversegram to State Paradigm Death and Shift Expectations under Win-Win and No Win-Win Situations

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

The history of science is one based on revolutions and discourse where a new paradigm arrives challenging the status quo with the promise of progress and if the evidence is there to justify paradigm shift on the basis of that promise the consensus will be to shift paradigms. Apparently the shift from Adam Smith's traditional market paradigm to the eco-economic or green market paradigm formalized in 2012/RIO conference meets all the requirements for paradigm shift listed above, but it was based on the accumulated environmental evidence for change only (e.g. pollution and degradation) leaving out the accumulated social evidence for change (e.g. poverty and inequality), but a progress towards sustainability none the less.

Not much seems to be written from the point of view of sustainability about paradigm changes such as paradigm death, paradigm shift and paradigm mergers. General goals of this paper are a) to introduce a sustainability inversegram that can be used to state paradigm death and shift expectations under win-win and under no win-win situations; and b) to use this expectation framework to show the structure before and after the paradigm shift from the traditional market to the green market under win-win eco-economic conditions.

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Keywords: Paradigm evolution; sustainability thinking; sustainability inversegram; paradigm death; sustainability gaps.

1. INTRODUCTION

1.1 The Growth of Knowledge and the Growth of Science

The history of science is one based on revolutions and discourse where a new paradigm arrives challenging the status quo with the promise of progress and if the evidence is there to justify paradigm shift on the basis of that promise the consensus will be to shift paradigms. Kuhn [1] highlighted the following: i) paradigm shift requires a unique approach; ii) that improves the past, not destroys it; iii) to provide a venue of scientific growth, iv) based on evidence of need for change; and v) so that it can facilitate consensus for paradigm shift. The above implies that the new paradigm persists and the old paradigm fades away as originally structured. We know that shifts can happen due to refutation based on experimental or observational grounds (Popper [2]) and when this happens a knowledge gap is creating and closing that gap leads to the growth of knowledge.

1.2 The Recent Paradigm Shift from Pure Economy to the Green Economy

The transition from the pure economy or traditional economy (T = aBc) to the green economy (GM = aBC) started in 1987 with the Bruntland Commission calls to fix it through sustainable development means (WCED [3]) and it was formalized in 2012(UNCSD [4]; UNCSD [5]). Apparently it meets all the requirements for paradigm shift listed above, but it was based on the accumulated environmental evidence for change only (e.g. pollution and degradation) leaving out the accumulated social evidence for change (e.g. poverty and inequality), but a progress towards sustainability none the less. It has recently been highlighted that the structure of green markets or eco-economic markets is different than the structure of pure economy only markets (Muñoz [6]) and that is important to make sure that green markets are implemented from the beginning in socially friendly ways (Muñoz [7]) to correct all the externality assumptions on which the traditional market of Adam Smith was based on (Muñoz [8]).

In other words the formalization of green growth means a) that green market based development is here to stay(OECD [9]; UNCSD [10]; WB [11]; TGGG [12]); b) that green market thoughts provide now the structure to implement sustainable development programs and goals locally and globally (UNDESA [13]; UN [14]; UNDESA [15]); and c) that green market ideas are behind the monitoring and evaluations of those sustainable development programs and goals (UN [16]; UN [17]; UNSC [18]). In summary, today, now the pure economy paradigm of Adam Smith is dead and the eco-economic or green economic paradigm lives.

1.3 The Need to Understand and Perhaps Predict Paradigm Shifts

Not much seems to be written from the point of view of sustainability about paradigm changes such as paradigm death, paradigm shift and paradigm mergers. It has been recently pointed out that the evolution of development paradigms point to a future under sustainability markets (Muñoz [19]) perhaps step by step (Muñoz [20]). General goals of this paper are a) to introduce a sustainability inversegram that can be used to state paradigm death and shift expectations under win-win and under no win-win situations; and b) to use this expectation framework to show the structure before and after the paradigm shift from the traditional market to the green market under win-win eco-economic conditions.

2. GOALS OF THIS PAPER

The goals of this paper are the following: a) To show how a sustainability inversegram can be constructed and use to highlight the concept of sustainability gaps associated to model expansion or contraction and their degree of stability; b) To indicate how sustainability gaps are created and what happens when they expand or contract due to model expansion or contraction; and to use this for stating general paradigm death and shift expectations and general paradigm merger and shift expectations; c) To highlight how sustainability gap expectations work under no win-win situations and under win-win situations; d) To provide a generalization of paradigm death and shift expectations under no win-win situations and paradigm merger and shift expectations under win-win situations; and e) to use this expectation framework to show the structure before and after

the paradigm shift from the traditional market to the green market under win-win eco-economic conditions.

3. METHODOLOGY

First, the terminology used is listed. Second, the paradigm merging rules are provided. Third, the rightgram concept is introduced. Fourth, the leftgram concept is shared. Fifth, the structure of the sustainability inversegram is highlighted. Sixth, the idea of sustainability gaps and their stability is indicated. Seventh, the idea of how sustainability gaps are created is introduced and the implication of what happen when they are expanded or contracted is given. Eight, some general paradigm death and shift expectations are highlighted associated with model expansion/maximization. Ninth, some general paradigm merging and shift expectations are stressed associated to model contraction/ optimization.

Tenth, the nature of the sustainability gap expectations under no win-win situations is stated. Eleventh, the structure of the sustainability gap expectations under win-win situations is shown. Twelfth, the generalizations of paradigm death and shift expectations under no win-win situations are given. Thirteenth, the generalizations of paradigm merger and shift expectations under win-win situations are provided. Fourteenth, the structure before and after paradigm shift from the pure economy to the green economy is provided and the implications of this are highlighted. And finally some food for thoughts and relevant conclusions are listed.

4. TERMINOLOGY

A = Active social system	a) Passive social system
B = Active economic system	b) Passive economic system
C = Active environmental system	c) Passive environmental system
S = Sustainability	s = Unsustainability
PMR = Paradigm merging rules	SR = Sustainability range
USR = Unsustainability range	SI = Sustainability inversegram
SG = Sustainability gap	NSG = Neutral sustainability gap
NNSG = Non-neutral sustainability gap	TSG = Total sustainability gap
PSG = Partial sustainability gap	M = Model
Mi = Model “i”	X = System X
Xi = System Xi	SSG = Social sustainability gap
ECSG= Economic sustainability gap	ESG = Environmental sustainability gap
T = Traditional market	GM = Green market

5. PARADIGM MERGING RULES (PMR)

If “A” and “B” are dominant characteristics; and “a” and “b” are their dominated or passive counter parts, the following is expected:

5.1 Merging under Dominant-dominant Interactions

Under these conditions, dominant or active state prevails as indicated:

(AA) → A (BB) → B (AA) (BB) = (AB)(AB) → AB

5.2 Merging under Dominated-dominated Interactions

Under these conditions, the dominated or passive form prevails as shown:

(aa) → a (bb) →b (aa) (bb) = (ab)(ab) → ab

5.3 Merging under Dominant-dominated Interactions and Win-win Solutions

Under these conditions, the dominant or active system prevails as the system merge as shown below:

(Aa) → A (bB) → B (Aa) (bB) = (AB)(ab) → AB

5.4 Merging under Dominant-dominated Interactions and No Win-win Solutions

Under these conditions, the dominated or passive system prevails and the system collapses as shown below:

(Aa) → a (bB) → b (Aa) (bB) = (AB)(ab) → ab

6. SUSTAINABILITY RANGE (SR)

As shown in the rightgram in Fig. 1 below, the sustainability range under conjunctural interactions goes from zero (full unsustainability/full exclusion) to one (full sustainability/*full* inclusion).

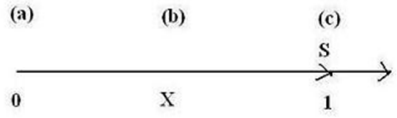

Fig. 1. The sustainability range (SR)

Notice that at point (a) there is full unsustainability/full exclusion; at point (b) there is partial sustainability/partial inclusion indicated by the letter "X"; and at point (c) there is full sustainability/full inclusion. Hence, the sustainability range (SR) is $0 \leq S \leq 1$, so sustainability goes from no sustainability to full sustainability.

7. UNSUSTAINABILITY RANGE (USR)

As indicated in the leftgram in Fig. 2 below, the unsustainability range (USR) under conjunctural interactions goes from one (full sustainability/full inclusion) to zero (full unsustainability/full exclusion).

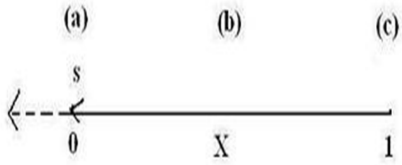

Fig. 2. The unsustainability range (USR)

Notice that at point (a) there is full unsustainability/full exclusion; at point (b) there is partial unsustainability/partial exclusion as indicated by the letter "X"; and at point (c) there is full sustainability/full inclusion. Therefore, the unsustainability range (USR) is $0 \leq s \leq 1$, so unsustainability goes from no unsustainability to full unsustainability.

8. THE SUSTAINABILITY INVERSEGRAM (SI)

When you put together the sustainability rightgram and the unsustainability leftgram we construct the structure of the sustainability inversegram(SI) as indicated in Fig. 3 below:

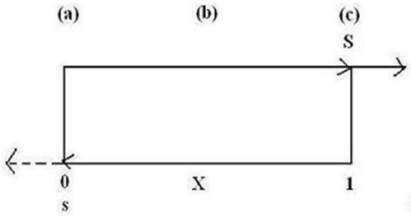

Fig. 3. The sustainability inversegram (SI)

As it can be seen in the Fig. 3 above the sustainability inversegram highlights full sustainability boundaries at point "c" and full unsustainability boundaries at point "a"; and between these two boundaries we can have points of partial unsustainability/partial sustainability such as at point "b" indicated by letter "X". The inversegram in Fig. 3 above gives the idea that a move to the right of point (b) means a move towards increasing sustainability or decreasing unsustainability; and a move to the left of point (b) is a move towards decreasing sustainability or increasing unsustainability.

9. SUSTAINABILITY GAPS (SG)

There are different types of sustainability gaps, which can be appreciated in the inversegram in Fig. 4 below:

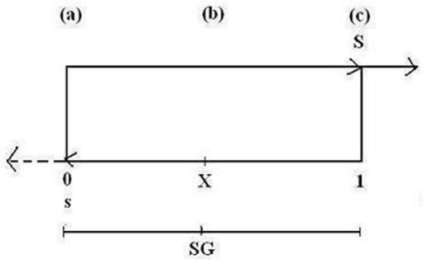

Fig. 4. Sustainability gaps (SG)

According to the inversegram in Fig. 4 above there are two types of sustainability gaps (SG): i) Neutral sustainability gap (NSG) such as at point (c), when all the components of the system are in active form. At point (c) the sustainability gap is stable(SG = 1); and ii) Non-neutral sustainability gap(NNSG) such as any point to the left of point (c) all the way to point (a), when at least one component of the system is in passive form. So the range of non-neutrality gaps or unstable sustainability gaps is $0 \leq SG < 1$.

And there are two types of non-neutral sustainability gap(NNSG) based on the inversegram in Fig. 4 above: i) Total sustainability gap (TSG), when all components of the system are in passive form or the point of full unsustainability such as at point (a); and ii) Partial sustainability gap (PSG), any point between point (a) and point (c), when at least one component of the system is in active form or a point of partial unsustainability or partial sustainability.

10. STABILITY OF SUSTAINABILITY GAPS (SG)

Based on the inversegram in Fig. 5 below we can see two things: i) as development under sustainability(S) increases, moving to the right towards point (c), the sustainability gap decreases (SG--→1) and the stability of the sustainability gap improves. And at point (c) there is no sustainability gap(SG = 1); and therefore, the system is fully stable; and ii) as development under sustainability(S) decreases moving to the left towards point (a), the sustainability gap increases(SG---→0) and the stability of the sustainability gap worsens. At point (a) there is full unsustainability(SG = 0); and therefore, the system is fully unstable (SG = 0).

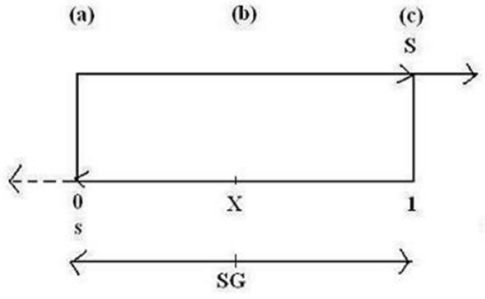

Fig. 5. Stability of the sustainability gaps

In other words, in the inversegram in Figure 5 above we can see the following: i) That at point (c) there is a neutral sustainability gap (NSG) and therefore the system is stable as the gap is stable(SG = 1); ii) That at point (a) there is full unsustainability so the system is fully unstable as the gap is fully unstable(SG = 0); and iii) that between point (a) and point (c) such as at point (b) there is partial unsustainability or partial sustainability; and therefore there are partial sustainability gaps(PSG) at point "X" as the system is partially stable. Hence the range of partial sustainability gaps is $0 < SG < 1$.

11. CREATING SUSTAINABILITY GAPS

When we assume that a model(M) driven by system X exists to the left of point "c" and away from full sustainability (S) we are creating sustainability gaps (SG), as indicated in the inversegram in Fig. 6 below:

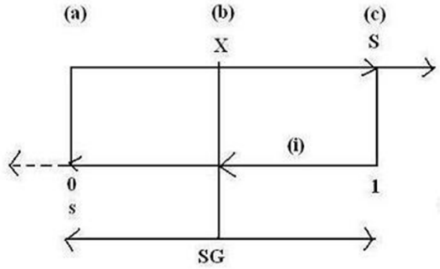

Fig. 6. Creating sustainability gaps M= X(SG)

The inversegram in Fig. 6 above shows at point (b) the position of the system X driving model M and the distance between point (b) and point (c) represented by arrow (i) is its associated sustainability gap (SG). Hence, the arrow line (i) is the sustainability debit/deficit associated to the system X as sustainability gaps are sustainability debits/deficits. So the structure of model at point (b) is M = X(SG), and the sustainability gap(SG) is $0 < SG =$ line (i) < 1) as it is a partial sustainability gap (PSG).

In other words, model M has two components: the system X driving it and its associated sustainability gap (SG) or sustainability debit/deficit. And see that the structure of the sustainability model at point (c) is S = S(SG) = S(1) = S as the sustainability gap at point (c) is one(SG = 1), confirming that under sustainability there are no sustainability gaps. And notice that if model M were to shift left to point "a" then the sustainability gap stability would be fully

unstable(SG = 0), hence M = X(SG) = X(0)---→ the system M would collapse.

12. EXPANDING SUSTAINABILITY GAPS

As development of model M takes place the sustainability gap associated to the model M expands accumulating sustainability deficits, which increases the unsustainability of the system forcing the model M to shift to the left. As the accumulation of sustainability deficits expands as the sustainability gap(SG) expands the system M shifts to a point of greater unsustainability, a situation that can be appreciated in Fig. 7 below:

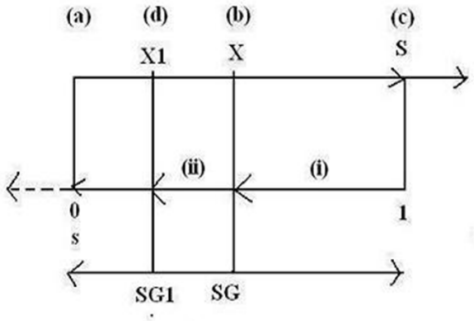

Fig. 7. Linking development and wider sustainability gaps Expanding X to XI widens the sustainability gap from SG to SGI

We can see in Fig. 7 above that as we expand the development of driver X of model M from X to X1 we expand its sustainability gap from SG to SG1 associated to model M increasing the overall sustainability gap by the distance represented by arrow (ii); and therefore SG1 > SG as it has accumulated more sustainability deficits. At point (d) then, the model M is in a more unsustainable position than at point (b) as it has accumulated more sustainability deficits. In other words, if we expand M means we expand X and therefore we expands SG and the model M will shift to the left, repeating the shifting to the left each time model M expands.

13. CLOSING SUSTAINABILITY GAPS

As associated sustainability gaps are closed in model M, the factor X driving the model M contracts accumulating sustainability credits contracting sustainability gaps, which increases the sustainability of the system inducing the shift of model M to the right, a situation that can be appreciated in Fig. 8 below:

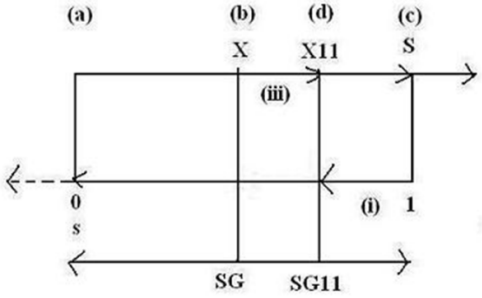

Fig. 8. Linking development and the closing of sustainability gaps Contacting X to XII also contacts the sustainability gap from SG to SGII

We can see in the Fig. 8 above that as we contract the development of driver X of model M from X to X11 we reduce its sustainability gap from SG to SG11 associated with model M decreasing the overall sustainability gap and sustainability deficits by the distance represented by arrow (iii); and therefore SG11 < SG as model M has eliminated sustainability deficits when closing sustainability gaps.

Therefore, at point (d) then, the model M is in a more sustainable position than at point (b) as it has eliminated sustainability deficits. In other words, if we contract M means we contract X and therefore we contract SG and the model M will shift to the right, repeating the shifting to the right each time model M contracts. See that if model M were to shift to the right at point "c" the sustainability gap would be neutral(SG =1) and therefore at point "a" we would have: M = X(SG) = X(1) = X = S as M takes the sustainability structure.

14. PARADIGM DEATH AND SHIFT EXPECTATIONS

If the system X driving model M expands for ever from X, X1, X2…., then it will also expand its associated sustainability gap from SG, SG1, SG2…. And therefore, as model M expands it will increasingly expand the accumulation of sustainability deficits, and when the stability of sustainability gaps approaches full unsustainability (SG--→0), the system M will collapse and lose its original structure; and it will shift its structure (M = X(SG)---→ S) taking the form of a full sustainability model(S) as in this example or taking the form of a more sustainable structure in general. This situation can be appreciated in Fig. 9 below:

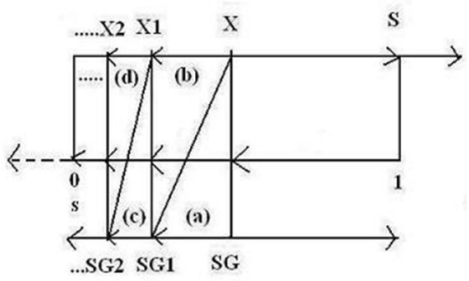

Fig. 9. Paradigm death and shift expectations As system X expands for ever its associated sustainability gap will expand for ever too until it reaches full unsustainability bring the system X down and then shifting to the structure of S

In the inversegram in Fig. 9 above we can see that the driver X of model M cannot shift to the left and expand for ever accumulating sustainability deficits as when the sustainability gaps associated to its expansion approaches full unsustainability(SG---→ 0) it will collapse and lose its original structure and shift to a sustainability model(S) as in this case or shift to a more sustainable structure in general. In other words, expanding model M for ever means system collapse and shift as the sustainability gap will sooner or later tend towards full unsustainability(SG--→0) bringing the whole system M down and the lost of its original paradigm structure, which analytically can be expressed as follows:

Since we have M = X(SG), then:

Expanding M for ever = Max(X)Max(SG)
Therefore if Max(SG)----→0, we have the following:

Expanding M for ever = Max(X)[Max(SG)---→0]---→0 = collapse of M losing its original structure and shifting to new more sustainable paradigm structures

Under the conditions above the paradigm shift after collapse has the form:

M = X(SG)---→S as SG--→0 and therefore now M = S

15. PARADIGM MERGER AND SHIFT EXPECTATIONS

If the system driving model M contracts for ever from X, X11, X22…..it will also contract its associated sustainability gap from SG, SG11, SG22… and therefore, it will increasingly contract the accumulation of sustainability deficits, and when the sustainability gaps approaches full sustainability(SG--→1), the system will merge losing its original structure in the process; and then it will shift taking the form of a full sustainability model(S) as in this case or shift into more sustainable structures. This situation can be appreciated in Fig. 10 below:

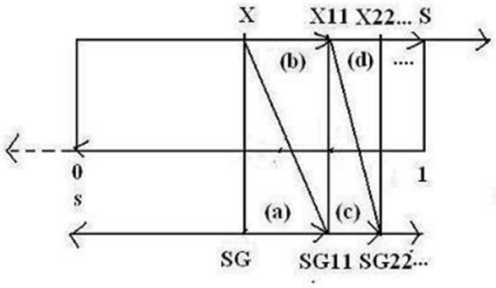

Fig. 10. Paradigm merger and shift expectations As system X closes its associated sustainability gaps for ever it contracts for ever too approaching the point of full sustainability until it dies and shift to take the form of S

In Fig. 10 above we can see that the driver X of model M can contract for ever increasingly eliminating sustainability deficits as the sustainability gaps associated to its expansion approaches full sustainability(SG---→ 1) it will merge and shift into a sustainability model(S) losing its original structure in the process as in this case or shift into more sustainable structures in general. In other words, contracting model M for ever means system merger and shift as the sustainability gap tends towards full sustainability (SG----→1) and losing its original structure, which analytically can be expressed as follows:

Since we have M = X(SG), then:

Contract M for ever = contract(X)contract(SG)

Therefore if contract (SG)-----→ 1 we have the following:

Contract M for ever = contract(X)[contract(SG)---→1]----→1 = death of original structure of M and merger and shift to new more sustainable structures

Under the conditions above the merging after death has the form:

M = X(SG) ---→S as SG---→1 and therefore now M = S

16. SUSTAINABILITY GAPS EXPECTATIONS UNDER NO WIN-WIN SITUATION

Let's assume we have two components, A = society and B = economy, and so the three sustainability models possible based on their combination are: M1 = Ab, M2 = aB; and M3 =AB = S. Their position in the sustainability inversegram can be indicated as in Fig. 11 below:

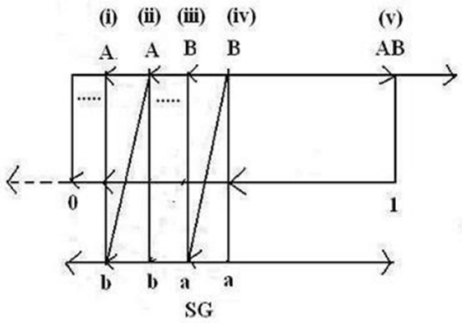

Fig. 11. Paradigm death and shift expectations MI = Ab M2 = aB M3 = AB Under no win-win situation model M1 and M2 will expand and shift to the left until they are brought down by their associated sustainability gaps and then they will take the form of M3 = AB

In Fig. 11 above, Model M1=Ab is at point (ii), model M2=aB is at point (iv); and model M3=AB = S is at point (v). Model M1 has an economic sustainability gap(ECSG=b), model M2 has a social sustainability gap(SSG=a), and model M3 has no sustainability gaps(SG =1).

It can be said based on the inversegram in Fig. 11 above that if there are no win-win situations either model M1 or model M2 or both at the same time would collapse in the long term and lose their original structure as they and their sustainability gaps expand and shift constantly to the left and towards full unsustainability. And this can be used for the following generalization:

Expectation: *When there are dominant-dominated system interactions and there are no win-win situations or merging solutions there are sustainability gaps or sustainability debits/deficits, which sooner or later will lead to paradigm death and paradigm shift.*

16.1 The Case of Paradigm M1 = Ab

We can see that it has an economic sustainability gap(ECSG = b), so it can be expressed as follows:

M1 = A(ECSG)

And as system A in M1 continues to expand and expand to the left in Fig. 11 above such as from point (ii) to point (i) and so on as there are no win-win situations, then its economic sustainability gap tends to zero(ECSG = b ---→0) and the system collapses and loses its original structure so we have the following expectation:

M1 = A[(ECSG = b ---→0)]---→0 = M1 collapses losing its original structure and then M1 shifts towards sustainability(M1---→S = M3). So now the sustainability inversegram in Fig. 11 would have only two models M2 and M3.

The paradigm shift after collapse towards new paradigm has the following structure:

M1 = Ab ----→AB = S = M3 as M1 closes its economic sustainability gap(ECSG = b---→B)

16.2 The Case of Paradigm M2= aB

We can see that it has a social sustainability gap(SSG = a), so it can be expressed as follows:

M2 = (SSG)B

And as system B in model M2 continues to expand and expand to the left in Fig. 11 above such as from point (iv) to point (iii) and so on as there are no win-win situations, then its social sustainability gap tends to zero(SSG = a ---→0) and the system collapses and loses its original structure so we have the following expectation:

M2 = [(SSG = a ---→0)]B---→0 = M2 collapses losing its original structure and then M2 shifts towards sustainability(M2--→S = M3). Now the sustainability inversegram in Fig. 11 above would have only two models M1 and M3.

The paradigm shift after collapse towards new paradigm has the following structure:

M2 = aB ----→AB = S = M3 as M2 closes its social sustainability gap(SSG = a---→A)

16.3 The Clash of M1M2

The clash of two competing and extremely opposite paradigms gives the feeling of so called cold wars, which turn out to be a clash between the state of competing sustainability gaps under no win-win situations, as indicated below system to system:

M1.M2 = (Ab) (aB) = A(ECSG)(SSG)B

Notice that the above expression is the same as the following as the system M as a whole:

M = M1.M2 = (Ab)(aB) = (Aa)(bB) = [A(SSG)][(ECSG)B]

The clash above is a clash between the economic sustainability gap(ECSG) in M1 and the social sustainability gap(SSG) in M2. In this type of conflict we can have two situations: i) If a paradigm in conflict sticks to no win-win situations to the end shifting left and accumulating deficits to the end then that paradigm will collapse and then shift towards sustainability as the dominant components will prevail(S = M3); and the other paradigm will keep its structure intact after surviving the clash; and ii) if the paradigm in conflict suddenly see win-win alternatives it will die or lose its original structure and merge into a sustainability model as the dominant components will prevail(S = M3); and the other paradigm will keep its structure intact after surviving the clash.

Expectation: *In modern economies when a conflict for dominance between economic sustainability gaps (ECSG) in one system and social sustainability gaps (SSG) in another system arises the system with the economic sustainability gap and accumulated capitalism deficit will not be able to buy time to avoid collapse under no win-win situations. And therefore, the paradigm with the economic sustainability gap will collapse and lose its original structure and shift toward sustainability(S = M3); and the paradigm without the economic sustainability gap will retain its structure and survive the clash. In other words, in modern economies egalitarian but economically poor systems will lose a clash against very unequal, but rich systems as capitalism credits can buy time to wait for the storm to pass when facing paradigm clashes.*

Therefore in the clash M1M2 described above, M1 = A[ECSG = b--→0]--→0 will collapse as originally structured as its ECSG = b---→0 and then M1 will shift towards sustainability(M1---→ S = M3); and M2 will retain its structure, so the sustainability inversegram in Fig. 11 above would have only two models M2 and M3.

The shift of model M1 after the collapse takes the following form:

M1 = Ab--→AB = S = M3 as M1 closes its economic sustainability gap(ECSG = b--→B) after the collapse.

16.4 The Clash of M1M3

The structure of this clash is below:

M1.M3 = (Ab) (AB)

Since M1 has an economic sustainability gap(ECSG = b), the clash can be expressed as follows system to system:

M1M3 = [A(ECSG)](AB)

The above says this is a clash between a system with one sustainability gap and another with no sustainability gaps.

And the above expression is equivalent to the one shown below from the whole system M point of view:

M1M3 = (Ab)(AB) = (AA)(bB) = A[(ECSG)B]

Expectation: *In modern economies when a conflict for dominance between systems with sustainability gaps (SG) and systems without sustainability gaps takes place and there are no win-win situations, the system with sustainability gaps, in this case economic sustainability gaps (ECSG) will collapse and lose its original structure and then merge into a sustainability model. Only sustainability markets will prevail.*

Therefore in the clash M1M3 described above, M1= A[ECSG = b--→0]--→0 will collapse as originally structured as its ECSG ---→0 and then M1 will shift towards sustainability(M1---→ S = M3); and M3 will retain its structure, so the sustainability inversegram in Fig. 11 above would have only two models M2 and M3.

The shift of model M1 after the collapse takes the following form:

M1 = Ab--→AB = S = M3 as M1 closes its economic sustainability gap(ECSG = b--→B) after the collapse.

16.5 The Clash M2M3

The structure of this clash is below:

M2.M3 = (aB) (AB)

Since M2 has a social economic sustainability gap(SSG = a), the clash can be expressed as follows system to system:

M2M3 = [(SSG)(B](AB)

The above says this is a clash between a system with one sustainability gap and another with no sustainability gaps.

The expression above is equivalent to the one indicated below from the whole system M point of view:

M = M2M3 = (aB)(AB) = (aA)(BB) = [(SSG)A]B

Expectation: *In modern economies when a conflict for dominance between systems with sustainability gaps (SG) and systems without sustainability gaps takes place and there are no win-win situations, the system with sustainability gaps, in this case social sustainability gaps (SSG) will collapse and lose its original structure and then merge into a sustainability model. Only sustainability markets will prevail.*

Therefore in the clash M2M3 described above, M2= [SSG = a--→0]B--→0 will collapse as originally structured as its SSG ---→0 and then M2 will shift towards sustainability(M2---→ S = M3); and M3 will retain its structure, so the sustainability inversegram in Fig. 11 above would have only two models M1 and M3.

The shift of model M2 after the collapse takes the following form:

M2 = aB---→AB = S = M3 as M2 closes its social sustainability gap(SSG = a--→A) after the collapse.

17. SUSTAINABILITY GAPS EXPECTATIONS UNDER WIN-WIN SITUATIONS

Let's assume again we have two components, A = society and B = economy, and so the tree sustainability models possible based on the combination of them are: M1 = Ab and M2 = aB and M3 =AB = S, then their positions in the sustainability inversegram can be indicated as shown in Fig. 12 below:

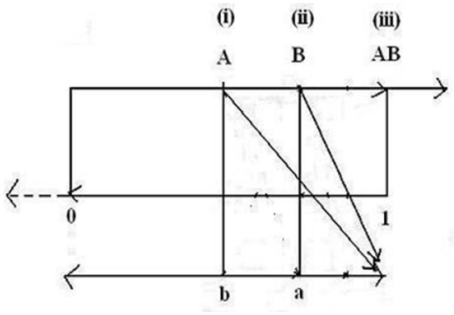

Fig. 12. Paradigm merger and shift expectations MI = Ab M2 = aB M3 = AB If there are win-win situation model M1 and model M2 will close their respective sustainability gaps and die and shift to right to take the form of M3 = AB

Based on Fig. 12 above if there are win-win situations model M1 or model M2 or both at the same time would close their sustainability gaps and shift to the right towards full sustainability at point (iii). And this leads to the following generalization:

Expectation: *When there are dominant-dominated system interactions and there are win-win situations paradigm mergers and shift take place leaving no sustainability gaps.*

17.1 The Case of Paradigm M1= Ab

We can see that it has an economic sustainability gap(ECSG = b), so it can be expressed as follows:

M1 = Ab = A(ECSG)

And as model M1 sees win-win situations in closing its economic sustainability gap(ECSG = b ---→1) to shift towards full sustainability we have the following expectation:

M1 = A[(ECSG---→1)]--→1 = M1 as originally structured dies and merge and then M1 shifts towards sustainability(M1 = Ab--→S = AB= M3). So now the sustainability inversegram in Fig. 12 above would have only two models M2 and M3 as now M1 = M3.

The shift of model M1 under win-win situations takes the following form:

M1 = Ab--→AB = S = M3 as M1 closes its economic sustainability gap(ECSG = b--→B) to move to a full sustainability structure.

17.2 The Case of Paradigm M2 = aB

We can see that it has a social sustainability gap(SSG = a), so it can be expressed as follows:

M2 = aB = (SSG)B

And as M2 sees win-win situations in closing its social sustainability gap(SSG = a ---→1) and move to full sustainability we have the following expectation:

M2 = [(SSG ---→1)] B---→1 = M2 as originally structured dies and merge and then M2 shifts towards sustainability(M2 = aB--→S = AB= M3). So now the sustainability inversegram in Fig. 12 above would have only two models M1 and M3 as now M2 = M3

The shift of model M2 under win-win situations takes the following form:

M2 = aB--→AB = S = M3 as Me closes its social sustainability gap(SSG = a--→A) to move to a full sustainability structure.

17.3 The Case of the Clash of M1M2

The clash of opposing paradigms has the following structure:
M = M1.M2 = (Ab)(aB) = A(ECSG)(SSG)B
M = M1.M2 = (Aa)(bB) = [A(SSG)][(ECSG)B]

Under win-win situation both models M1 and M2 have an incentive to close their respective sustainability gaps at once and merge and then both shift towards sustainability as the one who does not do it will be left behind.

Expectation: *In modern economies when a conflict for dominance between economic sustainability gaps (ECSG) in one system and social sustainability gaps (SSG) in another system arises and there are win-win situations both systems will have an incentive to close their respective sustainability gaps and merge and shift structure towards sustainability. The paradigm with the economic sustainability gap will close it and shift toward sustainability(S = M3); and the paradigm with the social sustainability gap will close it and shift towards sustainability too. In other words, in modern economies egalitarian but poor systems in clash against very unequal, but rich systems will merge and shift toward sustainability if there are win-win situations.*

In the case of M1, as the ECSG--→1 then M1 will shift to the right in Fig. 12 to the full sustainability position closing its economic sustainability gap(ECSG = b---→B) and the following is true:

M1 = Ab--→ AB

In the case of M2 as SSG--→1, then M2 will shift to the right too in Fig. 12 above to the full sustainability position closing its social sustainability gap(SSG = a---→A) and the following is true:

M2 = aB---→AB.

So after closing the sustainability gaps the merger has the following form since M1 = M2 = AB

M = M1.M2 = (AB)(AB) = AB = S

And notice that under win-win situations the following expectations is also true:

M = M1.M2 = (Ab)(aB) ----→(AB)(AB) = AB = S
M = M1.M2 = (Aa)(bB) ----→(AA)(BB) = AB = S

17.4 The Case of the Clash of M1M3

The clash between systems with and without sustainability gaps has the following structure:

M = M1M3 = (Ab)(AB) = [A(ECSG)](AB)
M = M1M3 = (AA)(bB) = A[(ECSG)B]

When there are win-win situations system with sustainability gaps will merge to join systems with no sustainability gaps.

Expectation: *In modern economies when a conflict for dominance between systems with sustainability gaps (SG) and systems without sustainability gaps takes place and there are win-win situations, the system with sustainability gaps will die and then merge into a sustainability model. Only sustainability markets will prevail.*

Therefore in the clash M1M3 described above, M1= A[ECSG = b--→1]-→1 will die as originally structured as its ECSG ---→1 and then M1 will merge and shift towards sustainability(M1 = Ab---→ AB = S =M3); and M3 will retain its structure, so the sustainability inversegram in Fig. 12 above would have only two models M2 and M3.

The merging of these paradigms after the death of M1 takes the following form since now M1= AB after closing its economic sustainability gap(ECSG = b---→B):

M = M1M3 = (AB)(AB) = AB = S

Notice that under win-win situations the following expectations are also true:

M = M1M3 = (Ab)(AB) -----→(AB)(AB) = AB = S
M = M1M3 = (AA)(bB) -----→(AA)(BB) = AB = S

17.5 The Case of the Clash of M2M3

The clash between systems with and without sustainability gaps has the following structure:

M = M2M3 = (aB)(AB) = [(SSG)B](AB)
M = M2M3 = (aA)(BB) = [(SSG)A]B

When there are win-win situations system with sustainability gaps will merge to join systems with no sustainability gaps.

Expectation: *In modern economies when a conflict for dominance between systems with sustainability gaps (SG) and systems without sustainability gaps takes place and there are win-win situations, the system with sustainability gaps will die and then merge into a sustainability model. Only sustainability markets will prevail.*

Therefore in the clash M2M3 described above, M2 = [(SSG = a ---→1)]B--→1 will die as originally structure as its SSG ---→1 and then M2 will merge and shift towards sustainability(M2 = aB---→ S = AB =M3); and M3 will retain its structure, so the sustainability inversegram in Fig. 12 above would have only two models M1 and M3.

The merging of these paradigms after the death of M2 takes the following form since now M2= AB after closing its social sustainability gap(SSG = a---→A):

M = M2M3 = (AB)(AB) = AB = S

Notice that the following expectations also hold true under win-win situations:

M = M2M3 = (aB)(AB) ------→(AB)(AB) = AB = S
M = M2M3 = (aA)(BB) ------→(AA)(BB) = AB = S

18. GENERAL PARADIGM DEATH AND PARADIGM SHIFT EXPECTATIONS

When there are sustainability gaps (SG) and there are no win-win situations or win-win situations are avoided for too long, there will be paradigm deaths and paradigm shifts. And this is because as sustainability gaps tend to zero (SG--→0) as unsustainability tends to full unsustainability the whole system will collapse and new paradigms will re-align around the dominant components to form new paradigm shifts combinations:

18.1 Paradigm Death and the Case of Deep Paradigms

i. Pure economic/capitalistic models will collapse under social sustainability gaps (SSG) and/or environmental sustainability gaps (ESG) as they cannot live accumulating social and/or environmental deficits forever.
ii. Pure social/red socialist models will collapse under economic sustainability gaps (ECSG) and/or environmental sustainability gaps (ESG) as they cannot live accumulating economic and/or environmental deficits forever.
iii. Pure environment / green models will collapse under social sustainability gaps (SSG) and/or economic sustainability gaps (ECSG) as they cannot live accumulating social and/or economic deficits forever.

18.2 Paradigm Death and the Case of Partnership Based Paradigms

i. Socio-environmental/socio-ecology models will collapse under economic sustainability gaps (ECSG) as they cannot live accumulating economic deficits forever.
ii. Socio-economic / socio-capitalist models will collapse under environmental sustainability gaps (ESG) as they cannot live accumulating environmental deficits forever.
iii. Eco-economic / green capitalist models will collapse under social sustainability gaps (SSG) as they cannot live accumulating social deficits forever.

19. GENERALIZING PARADIGM MERGERS AND PARADIGM SHIFT EXPECTATIONS

When there are sustainability gaps (SG) and there are win-win situations there will be paradigm mergers and paradigm shifts. And this is because as sustainability gaps tend to one (SG--→1) then unsustainability tends to full sustainability and whole system merger will take place; and new paradigms will re-align around the dominant components of the merging paradigms to form new paradigm shift combinations:

19.1 Paradigm Merger and the Case of Deep Paradigms

i) Pure economic / capitalistic models and pure social /red socialist models under win-win situations will merge to form socio-capitalist models after closing associated social sustainability gaps (SSG) and economic sustainability gaps (ECSG).
ii) Pure social / red socialist models and pure environment/green models will merge under win-win situations to form eco-socialist models after closing associated social sustainability gaps (SSG) and environmental sustainability gaps (ESG).
iii) Pure environment / green models and pure economic / capitalist models will merge under win-win situations to form eco-economic models or green market models after closing associated economic sustainability gaps (ECSG) and environmental sustainability gaps (ESG).
iv) In summary: Under win-win situations any two deep paradigms will merge to form a new partnership paradigm after closing associated sustainability gaps.

19.2 Paradigm Merger and the Case of Partnership Based Paradigms

i) Socio-environmental/socio-ecology models and socio-economic/socio-capitalist models under win-win situations will merge and form a sustainability market model after closing associated economic sustainability gaps (ECSG) and environmental sustainability gaps (ESG).
ii) Socio-economic /socio-capitalist models and eco-economic /green market models under win-win situations will merge and form a sustainability market model after closing associated social sustainability gaps (SSG) and environmental sustainability gaps (ESG).
iii) Eco-economic / green capitalist models and eco-socialist models will merge under win-win situations to form a sustainability market model after closing associated social sustainability gaps (SSG) and economic sustainability gaps (ECSG).
iv) In summary: Under win-win situation two different partnership paradigms will merge to form a sustainability market model after closing associated sustainability gaps.

20. THE BEFORE AND AFTER STRUCTURE OF THE PARADIGM SHIFT FROM ADAM SMITH'S TRADITIONAL MARKET TO THE ECO-ECONOMIC OR GREEN MARKET PARADIGM

20.1 The structure of Adam Smith Model before the Shift

As in Adam Smith's model(T) only the economy matters(B), this can be analytically stated as follows:

T = aBc

If we make SSG = a and ESG = c, then the following is true:

T = (SSG)B(ESG)

The expression above says that the traditional market(T) is affected by a social sustainability gap(SSG) and by an environmental sustainability gap(ESG). Also we can see in that expression above that one sustainability gap or both at the same time can bring the traditional economy down under no win-win situations in the long term as their sustainability gaps tend to zero(SG--→0); and lead to paradigm collapse and shift. Moreover, we can see that closing one gap or the two gaps at the same time under win-win situation leads to paradigm death, merger and shift towards a more sustainable structure.

20.2 The Paradigm Shift from the Pure Economy (T) to the Eco-economy or Green Market (GM)

This paradigm shift took place under win-win eco-economic expectations so the structure of the paradigm death, merger, and shift looks as follows:

T = (SSG)B[(ESG = c------→1)---→1 = T as originally structured dies and merged and then T shifts towards the eco-economy or green economy(T = aBc---→ aBC = GM). Therefore, if we place the traditional market structure(T = aBc) and the green market structure(GM = aBC) in the inversegram in Fig. 12 above but with tree system components, the green market(GM) would be placed to the right of the traditional market(T) as it has a more sustainable structure as it is closer to the sustainability structure.

Therefore, the shift of the traditional market(T) to the eco-economic market or green market(GM) under win-win situations takes the following form:

T = aBc----→aBC = GM as T closes its environmental sustainability gap(ESG = c--→C) to move to a structure closer to the sustainability structure; and therefore, the green market(GM) is a more sustainable or stable structure than the traditional market(T).

Notice, this time around to save the economy the mainstream went green.

20.3 The structure of the Eco-economy or Green Market (GM) after the Paradigm Shift

GM = aBC

If we make SSG = a, then we have:

GM = (SSG)BC

The expression above says that as the green economy expands we should expect the social sustainability gap to expand too and with it we should expect the green market to keep shifting to the left in the sustainability inversegram as it accumulates social sustainability deficits.

Notice, next time around to save the green economy the mainstream may have to go red and move towards sustainability when it sees win-win situations in making green market policies fully socially friendly and it moves to close its social sustainability gap(SSG = a) affecting the green economy.

21. FOOD FOR THOUGHTS

a) *Is any type of development that hurts others when expanding desirable?*
b) *Will the structure of the next cold war be the clash of the red market(red economic man) and the green market(green economic man)?*
c) *When expanding the eco-economic or green market, are we maximizing or partially optimizing?*

22. CONCLUSIONS

First it was shown that the sustainability inversegram provides a good framework for sharing ideas on what happen when sustainability gaps are created and what happens to their stability as paradigms expand and contract for ever. Second, it was highlighted how paradigm death and shift expectations and paradigm merger and shift expectations are derived and how they work under no win-win situations and under win-win situations. And finally the generalizations of paradigm death and shift expectations under no win-win situations were highlighted as well as some food for thoughts.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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