

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

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.

Key words

Paradigm evolution, sustainability thinking, sustainability inversegram, paradigm death, paradigm shift, paradigm merger, sustainability gaps, sustainability deficits, model expansion, model contraction, paradigm collapse, paradigm expectations, rightgram, leftgram, sustainability range, deep paradigms, partnership based paradigms, sustainability, sustainability market, green market, eco-economic market, traditional market.

Introduction

a) 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(1970 Pp. 165-172) 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.

b) 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 1987) and it was formalized in 2012(UNCSD 2012a, 2012b). 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. Now the pure economy paradigm is dead and the eco-economic or green economic paradigm lives.

c) 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 2013) perhaps step by step(Muñoz 2015). 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.

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.

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.

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

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:

a) Merging under dominant-dominant interactions

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

136 $(AA) \rightarrow A \quad (BB) \rightarrow B \quad (AA)(BB) = (AB)(AB) \rightarrow AB$

137 **b) Merging under dominated-dominated interactions**

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

139 $(aa) \rightarrow a \quad (bb) \rightarrow b \quad (aa)(bb) = (ab)(ab) \rightarrow ab$

140 **c) Merging under dominant-dominated interactions and win-win solutions**

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

143 $(Aa) \rightarrow A \quad (bB) \rightarrow B \quad (Aa)(bB) = (AB)(ab) \rightarrow AB$

144 **d) Merging under dominant-dominated interactions and no win-win solutions**

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

147 $(Aa) \rightarrow a \quad (bB) \rightarrow b \quad (Aa)(bB) = (AB)(ab) \rightarrow ab$

148

149 **Sustainability range(SR)**

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

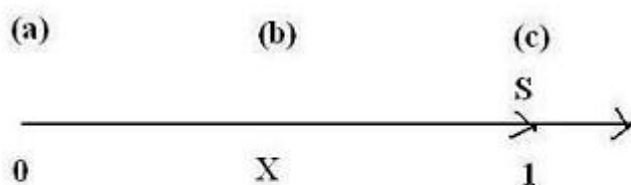


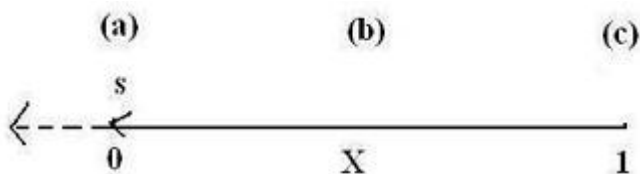
Figure 1 The sustainability range(SR)

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

158

159 Unsustainability range(USR)

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



163 **Figure 2 The unsustainability range(USR)**

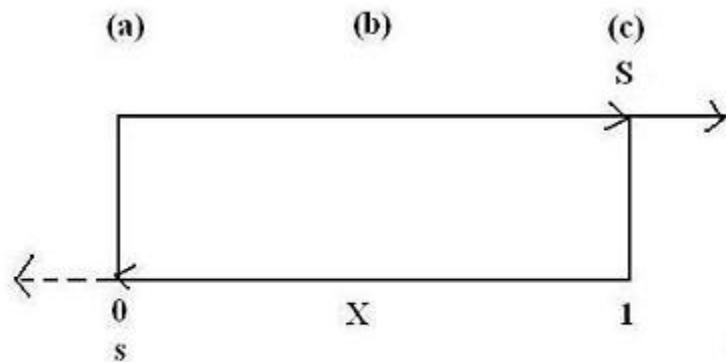
163

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

168

169 The sustainability inversegram(SI)

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



172 **Figure 3 The sustainability inversegram(SI)**

172

173 As it can be seen in the Figure 3 above the sustainability inversegram highlights full
 174 sustainability boundaries at point “c” and full unsustainability boundaries at point “a”; and
 175 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 Figure 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.

Sustainability gaps(SG)

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

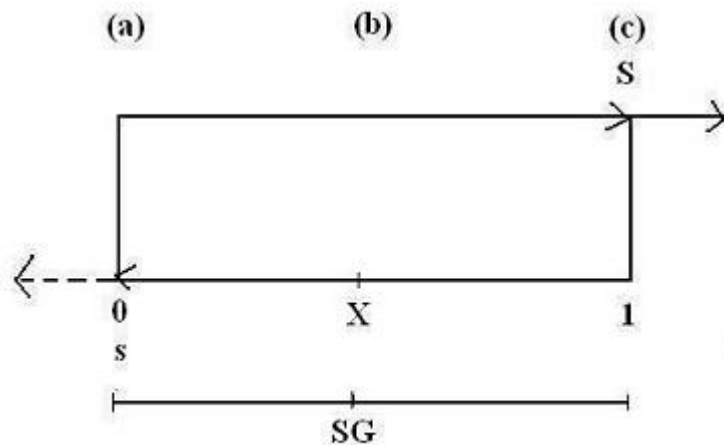


Figure 4 Sustainability gaps(SG)

According to the inversegram in Figure 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 Figure 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.

Stability of Sustainability gaps(SG)

Based on the inversegram in Figure 5 below we can see two things: i) as development under sustainability(S) increases, moving to the right towards point (c), the sustainability gap

200 decreases($SG \rightarrow 1$) and the stability of the sustainability gap improves. And at point (c) there is
 201 no sustainability gap($SG = 1$); and therefore, the system is fully stable; and ii) as development
 202 under sustainability(S) decreases moving to the left towards point (a), the sustainability gap
 203 increases($SG \rightarrow 0$) and the stability of the sustainability gap worsens. At point (a) there is full
 204 unsustainability($SG = 0$); and therefore, the system is fully unstable($SG = 0$).

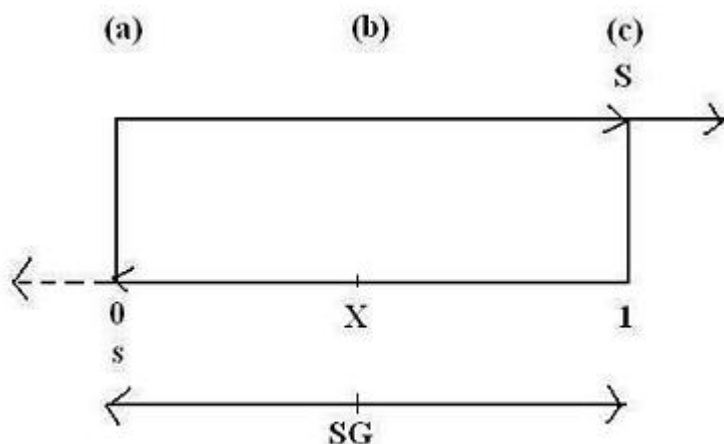


Figure 5 Stability of the sustainability gaps

205
 206 In other words, in the inversegram in Figure 5 above we can see the following: i) That at
 207 point (c) there is a neutral sustainability gap(NSG) and therefore the system is stable as the gap
 208 is stable($SG = 1$) ; ii) That at point (a) there is full unsustainability so the system is fully unstable
 209 as the gap is fully unstable($SG = 0$); and iii) that between point (a) and point (c) such as at point
 210 (b) there is partial unsustainability or partial sustainability; and therefore there are partial
 211 sustainability gaps(PSG) at point "X" as the system is partially stable. Hence the range of partial
 212 sustainability gaps is $0 < SG < 1$.

213 Creating sustainability gaps

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

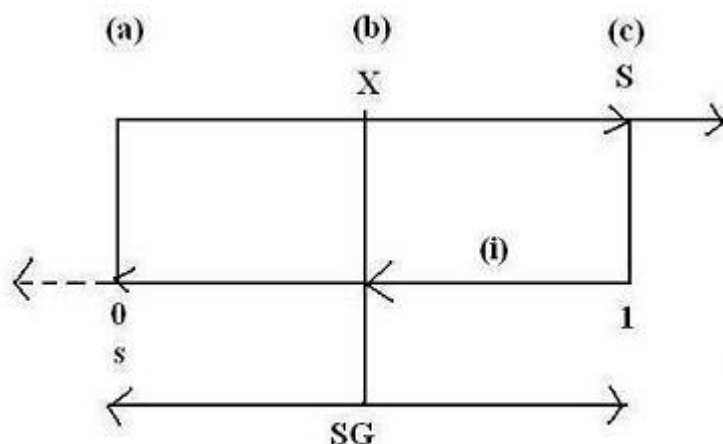


Figure 6 Creating sustainability gaps $M = X(SG)$

The inversegram in Figure 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 $0 < SG = \text{line (i)} < 1$ 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 $S = X(SG) = S(1) = S$ 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 $M = X(SG) = X(0) \rightarrow$ the system M would collapse.

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 Figure 7 below:

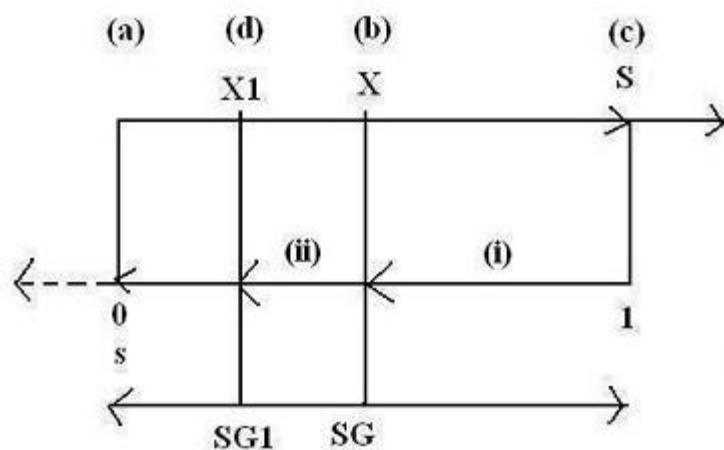


Figure 7 Linking development and wider sustainability gaps
Expanding X to X1 widens the sustainability gap from SG to SG1

We can see in figure 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.

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 Figure 8 below:

We can see in the Figure 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 $SG_{11} < SG$ 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.

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 ($SG \rightarrow 0$), the system M will collapse and lose its original structure; and it will shift its structure ($M = X(SG) \rightarrow S$) 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 Figure 9 below:

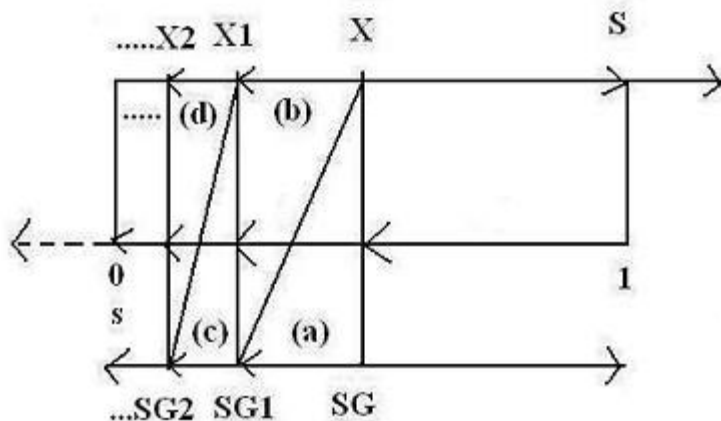


Figure 9 Paradigm death and shift expectations
As system X expands for ever its associated sustainability gap will expand for ever too until it reaches full unsustainability bring the system X down and then shifting to the structure of S.

In the inversegram in Figure 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($SG \rightarrow 0$) 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($SG \rightarrow 0$) 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 = $\text{Max}(X)\text{Max}(SG)$

Therefore if $\text{Max}(SG) \rightarrow 0$, we have the following:

Expanding M for ever = $\text{Max}(X)[\text{Max}(SG) \rightarrow 0] \rightarrow 0$ = 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:

$M = X(SG) \rightarrow S$ as $SG \rightarrow 0$ and therefore now $M = S$

291 Paradigm merger and shift expectations

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

298

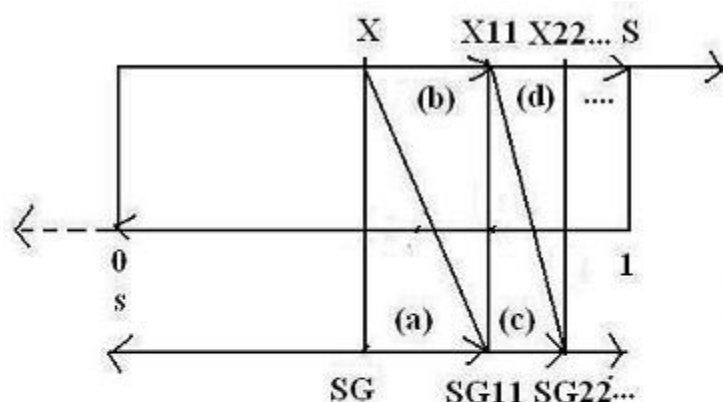


Figure 10 Paradigm merger and shift expectations
 As system X closes its associated sustainability gaps for ever it contracts for ever too approaching the point of full sustainability until it dies and shift to take the form of S.

299

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

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

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

309 Therefore if contract(SG) $\rightarrow$ 1 we have the following:

310 **Contract M for ever = contract(X)[contract(SG) $\rightarrow$ 1] $\rightarrow$ 1 = death of original structure**
 311 **of M and merger and shift to new more sustainable structures**

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

313 $M = X(SG) \rightarrow S$ as $SG \rightarrow 1$ and therefore now $M = S$

314

315 **Sustainability gaps expectations under no win-win situation**

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

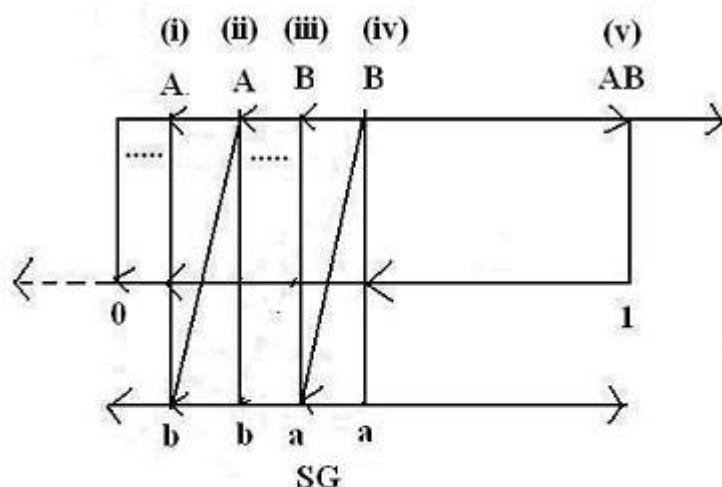


Figure 11 Paradigm death and shift expectations
 $M1 = Ab$ $M2 = aB$ $M3 = AB$
 Under no win-win situation model M1 and M2 will
 expand and shift to the left until they are brought
 down by their associated sustainability gaps and then
 they will take the form of $M3 = AB$.

319

320 In Figure 11 above, Model $M1=Ab$ is at point (ii), model $M2=aB$ is at point (iv); and
 321 model $M3=AB = S$ is at point (v). Model M1 has an economic sustainability gap($ECSG=b$),
 322 model M2 has a social sustainability gap($SSG=a$), and model M3 has no sustainability gaps(SG
 323 $=1$).

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

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

332 a) The case of paradigm M1 = Ab

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

$$335 \quad \mathbf{M1 = A(ECSG)}$$

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

340 **M1 = A[(ECSG = b $\rightarrow$ 0)] $\rightarrow$ 0 = M1 collapses losing its original structure and then M1**
341 **shifts towards sustainability(M1 $\rightarrow$ S = M3). So now the sustainability inversegram in**
342 **Figure 11 would have only two models M2 and M3.**

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

$$344 \quad \mathbf{M1 = Ab \rightarrow AB = S = M3 \text{ as M1 closes its economic sustainability gap(ECSG = b} \rightarrow \mathbf{B)}$$

345 b) The case of paradigm M2= aB

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

$$348 \quad \mathbf{M2 = (SSG)B}$$

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

353 **M2 = [(SSG = a $\rightarrow$ 0)]B $\rightarrow$ 0 = M2 collapses losing its original structure and then M2**
354 **shifts towards sustainability(M2 $\rightarrow$ S = M3). Now the sustainability inversegram in Figure**
355 **11 above would have only two models M1 and M3.**

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

$$357 \quad \mathbf{M2 = aB \rightarrow AB = S = M3 \text{ as M2 closes its social sustainability gap(SSG = a} \rightarrow \mathbf{A)}$$

358 c) The clash of M1M2

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

$$362 \quad \mathbf{M1.M2 = (Ab) (aB) = A(ESG)(SGG)B}$$

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

$$364 \quad \mathbf{M = M1.M2 = (Ab)(aB) = (Aa)(bB) = [A(SSG)][(ESG)B]}$$

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

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

384 Therefore in the clash M1M2 described above, $M1 = A[ESG = b \rightarrow 0] \rightarrow 0$ will
 385 collapse as originally structured as its $ESG = b \rightarrow 0$ and then M1 will shift towards
 386 sustainability($M1 \rightarrow S = M3$); and M2 will retain its structure, so the sustainability
 387 inversegram in Figure 11 above would have only two models M2 and M3.

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

$$389 \quad \mathbf{M1 = Ab \rightarrow AB = S = M3 \text{ as M1 closes its economic sustainability gap}(ESG = b \rightarrow B)}$$

390 **after the collapse.**

391 **d) The clash of M1M3**

392 The structure of this clash is below:

$$393 \quad \mathbf{M1.M3 = (Ab) (AB)}$$

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

396 $M1M3 = [A(ESG)](AB)$

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

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

401 $M1M3 = (Ab)(AB) = (AA)(bB) = A[(ESG)B]$

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

407 Therefore in the clash M1M3 described above, $M1 = A[ESG = b \rightarrow 0] \rightarrow 0$ will
408 collapse as originally structured as its ESG $\rightarrow 0$ and then M1 will shift towards
409 sustainability($M1 \rightarrow S = M3$); and M3 will retain its structure, so the sustainability
410 inversegram in Figure 11 above would have only two models M2 and M3.

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

412 $M1 = Ab \rightarrow AB = S = M3$ as M1 closes its economic sustainability gap($ESG = b \rightarrow B$)
413 after the collapse.

414 **e) The clash M2M3**

415 The structure of this clash is below:

416 $M2.M3 = (aB) (AB)$

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

419 $M2M3 = [(SSG)(B)](AB)$

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

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

424 $M = M2M3 = (aB)(AB) = (aA)(BB) = [(SSG)A]B$

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

430 Therefore in the clash M2M3 described above, $M2 = [SSG = a \rightarrow 0]B \rightarrow 0$ will collapse
 431 as originally structured as its $SSG \rightarrow 0$ and then M2 will shift towards sustainability($M2 \rightarrow S$
 432 $= M3$); and M3 will retain its structure, so the sustainability inversegram in Figure 11 above
 433 would have only two models M1 and M3.

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

435 **$M2 = aB \rightarrow AB = S = M3$ as M2 closes its social sustainability gap($SSG = a \rightarrow A$) after the**
 436 **collapse.**

437

438 **Sustainability gaps expectations under win-win situations**

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

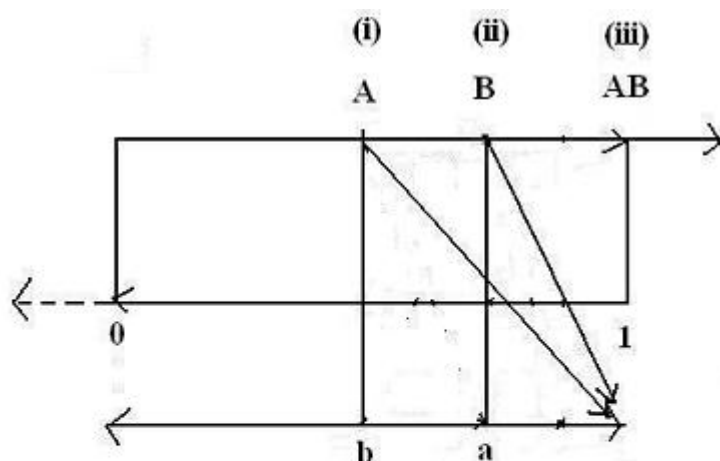


Figure 12 Paradigm merger and shift expectations
 $M1 = Ab$ $M2 = aB$ $M3 = AB$
 If there are win-win situations model M1 and
 model M2 will close their respective
 sustainability gaps and die and shift to right
 to take the form of $M3 = AB$.

443

Based on Figure 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.

a) 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($ECSG = b \rightarrow 1$) to shift towards full sustainability we have the following expectation:

$M1 = A[(ECSG \rightarrow 1)] \rightarrow 1 = M1$ as originally structured dies and merge and then M1 shifts towards sustainability($M1 = Ab \rightarrow S = AB = M3$). So now the sustainability inversegram in Figure 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:

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

b) 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($SSG = a \rightarrow 1$) and move to full sustainability we have the following expectation:

$M2 = [(SSG \rightarrow 1)] B \rightarrow 1 = M2$ as originally structured dies and merge and then M2 shifts towards sustainability($M2 = aB \rightarrow S = AB = M3$). So now the sustainability inversegram in Figure 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:

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

474 c) The case of the clash of M1M2

475 The clash of opposing paradigms has the following structure:

$$476 \quad \mathbf{M} = \mathbf{M1.M2} = (\mathbf{Ab})(\mathbf{aB}) = \mathbf{A(ESCG)(SSG)B}$$

$$477 \quad \mathbf{M} = \mathbf{M1.M2} = (\mathbf{Aa})(\mathbf{bB}) = [\mathbf{A(SSG)}][\mathbf{(ESCG)B}]$$

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

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

490 In the case of M1, as the ESCG $\rightarrow$ 1 then M1 will shift to the right in Figure 12 to the
491 full sustainability position closing its economic sustainability gap(ESCG = b $\rightarrow$ B) and the
492 following is true:

$$493 \quad \mathbf{M1} = \mathbf{Ab} \rightarrow \mathbf{AB}$$

494 In the case of M2 as SSG $\rightarrow$ 1, then M2 will shift to the right too in Figure 12 above to
495 the full sustainability position closing its social sustainability gap(SSG = a $\rightarrow$ A) and the
496 following is true:

$$497 \quad \mathbf{M2} = \mathbf{aB} \rightarrow \mathbf{AB}.$$

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

$$500 \quad \mathbf{M} = \mathbf{M1.M2} = (\mathbf{AB})(\mathbf{AB}) = \mathbf{AB} = \mathbf{S}$$

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

$$502 \quad \mathbf{M} = \mathbf{M1.M2} = (\mathbf{Ab})(\mathbf{aB}) \rightarrow (\mathbf{AB})(\mathbf{AB}) = \mathbf{AB} = \mathbf{S}$$

$$503 \quad \mathbf{M} = \mathbf{M1.M2} = (\mathbf{Aa})(\mathbf{bB}) \rightarrow (\mathbf{AA})(\mathbf{BB}) = \mathbf{AB} = \mathbf{S}$$

504 d) The case of the clash of M1M3

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

$$507 \quad \mathbf{M} = \mathbf{M1M3} = (\mathbf{Ab})(\mathbf{AB}) = [\mathbf{A(ESCG)}](\mathbf{AB})$$

$$508 \quad \mathbf{M} = \mathbf{M1M3} = (\mathbf{AA})(\mathbf{bB}) = \mathbf{A[(ESCG)B]}$$

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

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

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

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

$$521 \quad \mathbf{M} = \mathbf{M1M3} = (\mathbf{AB})(\mathbf{AB}) = \mathbf{AB} = \mathbf{S}$$

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

$$523 \quad \mathbf{M} = \mathbf{M1M3} = (\mathbf{Ab})(\mathbf{AB}) \text{ -----} \rightarrow (\mathbf{AB})(\mathbf{AB}) = \mathbf{AB} = \mathbf{S}$$

$$524 \quad \mathbf{M} = \mathbf{M1M3} = (\mathbf{AA})(\mathbf{bB}) \text{ -----} \rightarrow (\mathbf{AA})(\mathbf{BB}) = \mathbf{AB} = \mathbf{S}$$

525 **e) The case of the clash of M2M3**

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

$$528 \quad \mathbf{M} = \mathbf{M2M3} = (\mathbf{aB})(\mathbf{AB}) = [\mathbf{(SSG)B}](\mathbf{AB})$$

$$529 \quad \mathbf{M} = \mathbf{M2M3} = (\mathbf{aA})(\mathbf{BB}) = [\mathbf{(SSG)A}] \mathbf{B}$$

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

532 **Expectation:** *In modern economies when a conflict for dominance between systems with*
533 *sustainability gaps(SG) and systems without sustainability gaps takes place and there are win-*

534 *win situations, the system with sustainability gaps will die and then merge into a sustainability*
 535 *model. Only sustainability markets will prevail.*

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

540 The merging of these paradigms after the death of M2 takes the following form since
 541 now $M2 = AB$ after closing its social sustainability gap($SSG = a \rightarrow A$):

542
$$M = M2M3 = (AB)(AB) = AB = S$$

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

544
$$M = M2M3 = (aB)(AB) \rightarrow (AB)(AB) = AB = S$$

545
$$M = M2M3 = (aA)(BB) \rightarrow (AA)(BB) = AB = S$$

546

547 **General paradigm death and paradigm shift expectations**

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

554 **a) Paradigm death and the case of deep paradigms:**

555
 556 i) Pure economic / capitalistic models will collapse under social sustainability gaps(SSG)
 557 and/or environmental sustainability gaps(ESG) as they cannot live accumulating social and/or
 558 environmental deficits forever.

559
 560 ii) Pure social / red socialist models will collapse under economic sustainability
 561 gaps(ESG) and/or environmental sustainability gaps(ESG) as they cannot live accumulating
 562 economic and/or environmental deficits forever.

563
 564 iii) Pure environment / green models will collapse under social sustainability gaps(SSG)
 565 and/or economic sustainability gaps(ESG) as they cannot live accumulating social and/or
 566 economic deficits forever.

567
 568
 569
 570

b) Paradigm death and the case of partnership based paradigms

i) Socio-environmental / socio-ecology models will collapse under economic sustainability gaps(ESG) 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.

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:

a) 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(ESG).

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(ESG) 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.

b) 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(ESG) 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(ESG).

iv) In summary: Under win-win situation two different partnership paradigms will merge to form a sustainability market model after closing associated sustainability gaps.

The before and after structure of the paradigm shift from Adam Smith's traditional market to the eco-economic or green market paradigm

a) 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:

$$1) T = aBc$$

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

$$2) T = (SSG)B(ESG)$$

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($SG \rightarrow 0$); 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.

b) 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:

$T = (SSG)B[(ESG = c \rightarrow 1) \rightarrow 1 = T$ as originally structured dies and merged and then T shifts towards the eco-economy or green economy($T = aBc \rightarrow aBC = GM$). Therefore, if we place the traditional market structure($T = aBc$) and the green market structure($GM = aBC$) in the inversegram in Figure 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:

$T = aBc \rightarrow aBC = GM$ as T closes its environmental sustainability gap($ESG = c \rightarrow C$) 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.

c) The structure of the eco-economy or green market(GM) after the paradigm shift

3) $GM = aBC$

If we make $SSG = a$, then we have:

4) $GM = (SSG)BC$

The expression 4 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.

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?

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.

References

Kuhn, Thomas S., 1970. **The Structure of Scientific Revolutions**, *The University of Chicago Press*, Second Edition, USA.

Muñoz, Lucio, 2013. [Utilitarianism, Raw Liberalism, Moral Liberalism, and True Sustainability: Basic Paradigm Foundations, Changing Assumptions, and the Evolution of Development Paradigms](#), In: *The Mother Pelican Journal*, Vol. 9, No. 1, January, Ed. Luis Gutierrez, PhD, USA.

Muñoz, Lucio, 2015. [Towards True Sustainability Step By Step Is Fine While There Is Time: Pointing Out The Unifying Nature Of True Sustainability With The Help Of The True Sustainability Wheel](#), *Weber Economics & Finance* (ISSN:2449-1662), Vol. 1 (3) 2015, Article ID wef_150, 321-329

United Nations Conference on Sustainable Development(UNCSD), 2012a. [Rio+20 Concludes with Big Package of Commitments for Action and Agreement by World Leaders on Path for a Sustainable Future](#), Press Release, June 20-22, New York, NY, USA.

United Nations Conference on Sustainable Development(UNCSD), 2012b. [The Future We Want](#), June 20-22, New York, NY, USA.

World Commission on Environment and Development(WECD), 1987. **Our Common Future**. London, Oxford University Press, UK.