True sustainability thinking 104: The socio-environmental pollution production problem, global warming, and sustainable development since 1987: Pointing out the future we should have constructed and the one we should have avoided in 1987.

By

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Abstract

The road to our common future was a road that was supposed to lead to the socio-environmental future we needed to build, a future towards a social and environmentally pollutionless world, but instead it led to a future we should have avoided, a future under permanent sustainable development based market failures. Perhaps this route was possible or it was allowed to go unchallenged because of true system sustainability paradigm shift knowledge such as socio-environmental paradigm shift knowledge gaps and true component sustainability paradigm shift knowledge gaps such as environmental paradigm shift knowledge gaps that lead to green markets/fully environmentally responsible markets; and social paradigm shift knowledge gaps that lead to red markets/fully socially responsible markets, knowledge gaps that are created when you shift from full social and/or environmentally dirty economies to a fully socially and/or environmentally clean economy, which hides transition tools available to fix the problem and it makes more attractive, specially politically, to use no transition development tools, and by doing this we give a blessing of permanency to the market failures we are supposed to be trying to fix. Among the goals of this paper are: i) to show analytically and graphically, using the critical anthropocentric environmental problem-solving impossibility zone theory, how and why sustainable development market tools and thinking should not have been expected to fix the socio-environmental pollution production problem linked to traditional market thinking as pollution production continue to take place in the permanent market failure under which each sustainable development market, be it the socio-environmentally based sustainable development market/socio-environmental sustainable development or socially based sustainable development market/social sustainable development market or an environmentally based sustainable development market/environmental sustainable development, works; and ii) And then use this framework to pointing out the future we should have constructed and the one we should have avoided in 1987.

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Introduction

A) The socio-environmental pollution production problem, global warming and sustainable development link since 1987

It has been recently highlighted (Muñoz 2025) that there is a pollution production problem separating irresponsible human behavior led market dynamics (IRHUBLE) from irresponsible human behavior led global warming (IRHULGW), a situation that existed in 1987

during the Brundtland Commission's Our Common Future (WCED 1987) when the world went the way of sustainable development based markets (SDM) to reflect socio-environmental responsibility, and which it is depicted in Figure 1 below:

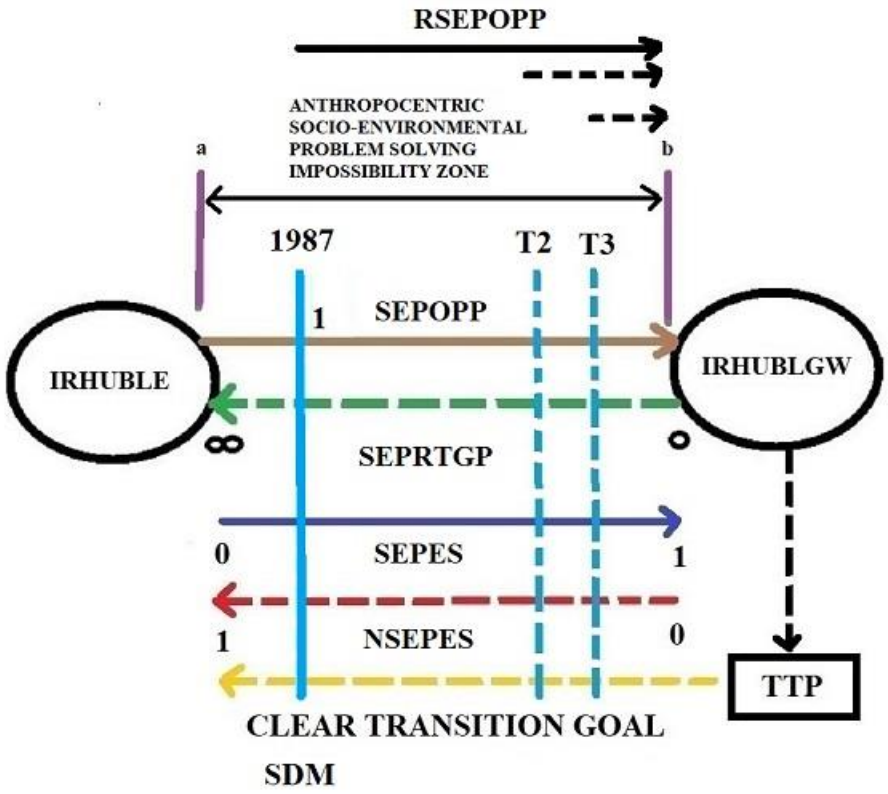

Figure 1 The use of sustainable development based markets (SDM) to address critical socio-environmental sustainability problems and the structure of expected failure.

Figure 1 above tells us that there is an anthropocentric socio-environmental problem-solving impossibility zone (ASEPSIZ) separating the socio-environmentally irresponsible dynamics of the market tool (IRHUBLE) and the irresponsible dynamics of the global warming problem (IRHUBLGW), and this zone begins at point "a" and ends at point "b". Figure 1 also shows that the 1987 sustainable development market tool (SDM) aimed at addressing the socio-environmentally pollution problem partially is a no transition to socio-environmental pollution-less market tool, which has a remaining socio-environmental pollution problem (RSEPOPP) attached as it works as shown by continues black arrow at top of Figure 1 going from left to right. Notice too that at point at point "b" you have a fully socio-environmentally dirty economy or fully dominant socio-environmentally pollution-based economy; and at point "a" you have a fully socio-environmentally clean economy or fully dominant socio-environmentally clean economy, and the position of the 1987 sustainable development markets and goals in between point "a" and point "b" means that they were implemented without a clear transition goal to one day move from socio-environmentally polluting economies to socio-environmentally clean economies.

B) The link between the anthropocentric socio-environmental critical problem-solving impossibility zone and socio-environmentally polluting and no socio-environmentally polluting sources of energy

Figure 1 above highlights too that the 1987 sustainable development markets (SDM) were set up in an environment where there is full socio-environmental pollution reduction technology gap (SEPRTGP) indicated by the broken green arrow going from right to left from "0" to ∞ as the market is run on socio-environmentally polluting sources of energy (SEPES) as indicated by the continues blue arrow going from left to right from 0 to 1 ; and hence these markets are lacking a supply of no socio-environmental polluting energy sources (NSEPES) as indicated by the broken red arrow going from right to left from 0 to 1; and since they were implemented in the absence of the need to transition to socio-environmentally clean economies as this need to transition to clean economies never was, and it has never been, one of the 17 sustainable development goals as anyone can find out(UN 2025).

Finally it is important to highlight that in Figure 1 above point "b" is a point of full socio-environmental cost externalization, and notice that point 1 on the vertical 1987 blue line of the sustainable development market SDM is a point of partial socio-environmental cost externalization; and the distance from point "a" to point "b" is the full socio-environmental pollution production problem SEPOPP while the distance from point "1" to point "b" is the remaining socio-environmental pollution production problem RSEPOPP linked to and affecting the working of the sustainable development market SDM

C) The need to understand the nature of the anthropocentric critical socio-environmental problem-solving possibility point

Notice that if we flip point "b" in Figure 1 above from being the point of full socio-environmental cost externalization to a point of full socio-environmental cost internalization, then we can create an anthropocentric critical socio-environmental problem solving possibility point, where the proper clear socio-environmental transition goal can be set up, which would determine the proper socio-environmentally friendly transition tool to put to work and would move to close the socio-environmental pollution reduction technology gap problem to release or produce no socio-environmental polluting energy sources needed to fully substitute socio-environmental polluting energy sources, and transition that way from socio-environmentally dirty economies to socio-environmentally clean economies.

D) The need to link the discussion above to the socio-environmental future we should have constructed and the one we should have avoided

Consistent with the discussion above it can be said that the road towards 1987 sustainable development was a road that was supposed to lead to the socio-environmental future we needed to build, a future towards a socio-environmental pollutionless world, but instead it led to a future we should have avoided, a future under ongoing sustainable development market failures.

The need to avoid the future we have not avoided seemed to be indirectly recognized when indicating the need to substitute non-renewable energy use for renewable ones to improve air quality and minimize other impacts (OECD 2025) and to solve the critical poverty problem through economic growth and inclusion(WB 2024) as its solution would bring global stability (OECD 2018; OECD 2024) as there is a current need to revert recent increases in as global poverty, all this means that the socio-environmental pollution production problem or situation SEPOPP is worse now that it was in 1987 despite sustainable development markets and goals being at work now for almost 30 years (1987-2026) or since then.

Perhaps this sustainable development route was possible or it was allowed to go unchallenged because of general sustainability market paradigm shift knowledge gaps such as socio-environmental paradigm shift knowledge gaps such as yellow sustainability or true sustainability paradigm shift knowledge gaps, and component specific sustainability market paradigm shift knowledge gaps such as red market paradigm shift knowledge gaps and green market paradigm shift knowledge gaps created when you shift from fully dirty economies to a fully clean economy, which hides possible transitions tools available and it makes more attractive, specially politically, to use no transition development tools to address true sustainability issues; and by doing this we give a blessing of permanency to the market failures we are supposed to be trying to fix. In other words, the Brundtland Commission(WCED 1987) built a road towards sustainable development markets under permanent socio-environmental market failures, and not a road towards socio-environmentally clean markets in similar fashion as the United Nations Commission on Environment and Development(UNCSD 2012a; UNCSD 2012b) when addressing the environmental crises never constructed a road towards environmentally clean economies(Muñoz 2022a), instead it developed a road towards dwarf green markets under permanent environmental market failure. The consequences and nature of green market paradigm shift avoidance and period 2012 to now have been recently pointed out (Muñoz 2022b; Muñoz 2024), which have similar, but parallel consequences at higher level responsibility positions as the true sustainability market paradigm shift avoidance period we have been experiencing technically since 1987 to now(1987-2025) when instead of going true sustainability markets to address head on the socio-environmental sustainability problem documented then in “Our Common Future” the world went a la sustainable development markets to handle a portion of the issue under market failures. Moreover, the idea that the knowledge base of the previous paradigm is left behind when shifting to higher level responsibility paradigms, including things such as the arrow impossibility theorem has been shared (Muñoz 2016) as well as the idea of how paradigm shift knowledge gaps are created and the implications of these gaps for mishandling paradigm evolution expectations under paradigm shift knowledge gaps have also been pointed out (Muñoz 2020). Among the goals of this paper are: i) to show analytically and graphically, using the critical anthropocentric socio-environmental problem-solving impossibility zone theory, how and why sustainable development tools and thinking cannot be expected to fix the socio-environmental pollution production problem linked to traditional market thinking as socio-environmental pollution production continues to take place

in the permanent socio-environmental market failure under which they work; and ii) And then use this framework to point out the socio-environmental future we should have constructed and the one we need to should have avoided in 1987.

Goals of this paper

a) To introduce the nature of the anthropocentric critical socio-environmental pollution problem-solving impossibility zone and socio-environmental critical problem-solving possibility point and their implications; and b) To use these frameworks to point out the socio-environmental future that we should have constructed and the one we need to should have avoided in 1987.

Methodology

1) The terminology and operation concepts used in this paper are given; 2) The no transition nature of sustainable development markets is highlighted; 3) To the nature of the anthropocentric critical socio-environmental pollution problem-solving impossibility zone and its implications is introduced; 4) The nature of the anthropocentric critical socio-environmental pollution problem-solving possibility point and its implications is stressed; 5) The anthropocentric critical socio-environmental pollution problem-solving possibility point to stress the socio-environmental future we should have constructed since 1987, but we did not is pointed out: 6) The anthropocentric critical socio-environmental pollution problem-solving impossibility zone framework is used to indicate the socio-environmental future we should have avoided in 1987, but we did not; and 7) Some relevant food for thoughts and conclusions are provided.

Terminology

TM = Traditional market

SDM = Sustainable development market

SEFSDM = Socio-environmentally friendly sustainable development market

EFSDM = Environmentally friendly sustainable development market

SFSDM = Socially friendly sustainable development market

TSM = S = True sustainability market

YSM = S = Yellow sustainability market

GM = Green market

RM = Red market

EM = Environmental margin

SM = Social margin

CLM = Clean market

SECLM = Socio-environmentally clean market

ECLM = Environmentally clean market

SCLM = Socially clean market

SEPES = Socio-environmentally polluting energy sources

EPES = Environmentally polluting energy sources

SPES = Socially polluting energy sources

NSEPES = No socio-environmental polluting energy sources

NEPES = No environmental polluting energy sources

NSPES = No socially polluting energy sources

SEPRTGP = Socio-environmental pollution reduction technology gap problem

EPRTGP = Environmental pollution reduction technology gap problem

SPRTGP = Social pollution reduction technology gap problem

SEPOPP = Socio-environmental pollution production problem

EPOPP = Environmental pollution production problem

SPOPP = Social pollution production problem

RSEPOPP = Remaining socio-environmental pollution production problem

REPOPP = Remaining environmental pollution production problem

RSPOPP = Remaining social pollution production problem

IRHUBLE = Irresponsible human behavior led economy

IRHUBLGW = Irresponsible human behavior led global warming

REHUBLE = Responsible human behavior led economy

REHUBLWG = Responsible human behavior led global warming

ASEPSIZ = Anthropocentric socio-environmental problem solving impossibility zone

AEPSIZ = Anthropocentric environmental problem solving impossibility zone

ASPSIZ = Anthropocentric social problem solving impossibility zone

ASEPSPP = Anthropocentric socio-environmental problem solving possibility point

AEPSPP = Anthropocentric environmental problem solving possibility point

ASPSPP = Anthropocentric social problem solving possibility point

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Operational concepts

1) Clean market, *a pollution-less market.*

2) Socio-environmentally clean market, *a socio-environmental pollution-less market.*

3) Environmentally clean market, *an environmental pollution-less market.*

4) Socially clean market, *a social pollution-less market.*

5) Dirty market, *a pollution production market.*

6) Socio-environmentally dirty market, *a socio-environmental pollution production market.*

7) Environmentally dirty market, *an environmental pollution production market.*

8) Socially dirty market, *a social pollution production market.*

9) Problem-solving impossibility zone, *the place where no full solution to the pollution production problem exists.*

10) Socio-environmental problem solving impossibility zone, *the place where no full solution to the socio-environmental pollution production problem exists.*

11) Environmental problem solving impossibility zone, *the place where no full solution to the environmental pollution production problem exists.*

12) Social problem solving impossibility zone, *the place where no full solution to the social pollution production problem exists.*

13) Problem solving possibility point, *the only place where the conditions for a full solution to the pollution production problem exist.*

14) Socio-environmental problem solving possibility point, *the only place where the conditions for a full solution to the socio-environmental pollution production problem exist.*

15) Environmental problem solving possibility point, *the only place where the conditions for a full solution to the environmental pollution production problem exist.*

16) Social problem solving possibility point, *the only place where the conditions for a full solution to the social pollution production problem exist.*

17) Pollution production problem, *the issue that separates dirty economies from clean economies.*

18) Socio-environmental pollution production problem, *the issue that separates socio-environmentally dirty economies from socio-environmentally clean economies.*

19) Environmental pollution production problem, *the issue that separates environmentally dirty economies from environmentally clean economies.*

20) Social pollution production problem, *the issue that separates socially dirty economies from socially clean economies.*

21) Anthropocentric clean economy, *a pollutionless economy led by responsible human behavior.*

22) Anthropocentric socio-environmentally clean economy, *a socio-environmental pollutionless economy led by socio-environmentally responsible human behavior.*

23) Anthropocentric environmentally clean economy, *an environmental pollutionless economy led by environmentally responsible human behavior.*

24) Anthropocentric socially clean economy, *a social pollutionless economy led by socially responsible human behavior.*

25) Anthropocentric dirty economy, *a pollution production economy led by irresponsible human behavior.*

26) Anthropocentric socio-environmentally dirty economy, *a socio-environmental pollution production economy led by socio-environmentally irresponsible human behavior.*

27) Anthropocentric environmentally dirty economy, *an environmental pollution production economy led by environmentally irresponsible human behavior.*

28) Anthropocentric socially dirty economy, *a social pollution production economy led by socially irresponsible human behavior.*

29) Anthropocentric problem-solving impossibility zone, *the place where no full solution to the anthropocentric pollution production problem exists.*

30) Anthropocentric socio-environmental problem-solving impossibility zone, *the place where no full solution to the anthropocentric socio-environmental pollution production problem exists.*

31) Anthropocentric environmental problem-solving impossibility zone, *the place where no full solution to the anthropocentric environmental pollution production problem exists.*

32) Anthropocentric social problem-solving impossibility zone, *the place where no full solution to the anthropocentric social pollution production problem exists.*

33) Anthropocentric problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric pollution production problem exist.*

34) Anthropocentric socio-environmental problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric socio-environmental pollution production problem exist.*

35) Anthropocentric environmental problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric environmental pollution production problem exist.*

36) Anthropocentric social problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric social pollution production problem exist.*

37) Anthropocentric pollution production problem, *the issue that separates anthropocentric dirty economies from anthropocentric clean economies.*

38) Anthropocentric socio-environmental pollution production problem, *the issue that separates anthropocentric socio-environmentally dirty economies from anthropocentric socio-environmentally clean economies.*

39) Anthropocentric environmental pollution production problem, *the issue that separates anthropocentric environmentally dirty economies from anthropocentric environmentally clean economies.*

40) Anthropocentric social pollution production problem, *the issue that separates anthropocentric socially dirty economies from anthropocentric socially clean economies.*

41) Anthropocentric socio-environmental problem-solving impossibility zone, *the place where no full solution to the anthropocentric socio-environmental pollution production problem exists.*

42) Anthropocentric environmental problem-solving impossibility zone, *the place where no full solution to the anthropocentric environmental pollution production problem exists.*

43) Anthropocentric social problem-solving impossibility zone, *the place where no full solution to the anthropocentric social pollution production problem exists.*

44) Anthropocentric socio-environmental problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric socio-environmental pollution production problem exist.*

45) Anthropocentric environmental problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric environmental pollution production problem exist.*

46) Anthropocentric social problem-solving possibility point, *the only place where the conditions for a full solution to the anthropocentric social pollution production problem exist.*

47) Anthropocentric socio-environmental pollution production problem, *the issue that separates anthropocentric socio-environmentally dirty economies from anthropocentric socio-environmentally clean economies.*

48) Anthropocentric environmental pollution production problem, *the issue that separates anthropocentric environmentally dirty economies from anthropocentric environmentally clean economies.*

49) Anthropocentric social pollution production problem, *the issue that separates anthropocentric socially dirty economies from anthropocentric socially clean economies.*

The no transition nature of sustainable development markets

As mentioned in the introduction, no transition tools to socio-environmentally clean markets were set up in 1987 (WCED 1987) when the decision to take action to solve the socio-environmental pollution problem associated with Adam Smith's traditional market thinking (Smith 1776) was formalized so making sustainable development markets no transition tools and the relevant tools to use as the one shown at point 1 in Figure 2 below:

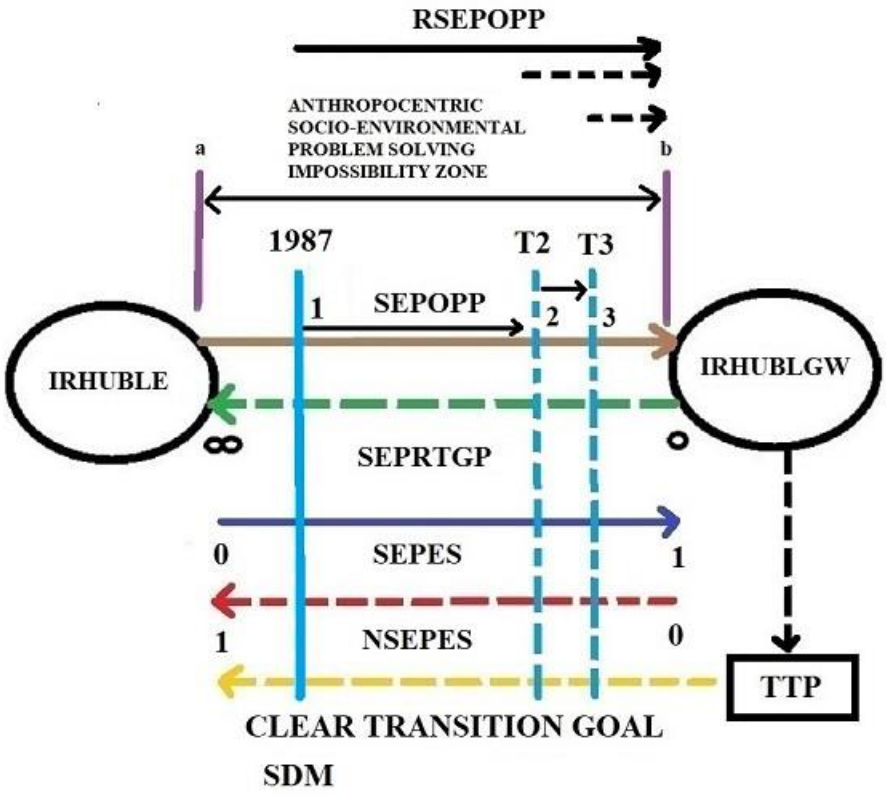

Figure 2 The nature of sustainable development markets (SDM) as no transition tools

Notice that in Figure 2 above the economy (E) is led (L) by irresponsible human behavior IRHUB so it is called irresponsible human led economy IRHBLE; and global warming (GW) in turn is led(L) by irresponsible human behavior(IRHUB) too so it is called irresponsible human behavior led global warming IRHBLGW; and these two irresponsible (IR) components are separated by the socio-environmental pollution production problem SEPOPP associated with the irresponsible economy (IRHUBLE), and the 1987 sustainable development market tools SDM sits in between them and it is aimed at partially addressing this socio-environmental pollution production problem using socio-environmentally friendly sustainable development thinking.

Hence, Figure 2 above displays the structure of the 1987 sustainable development markets SDM as a vertical line managing just part of the socio-environmental pollution production problem at point 1 on the SEPOPP unbroken black arrow going from irresponsible market dynamics IRHUBLE to irresponsible global warming dynamics IRHUBLGW. See that point “b” here is the point of full socio-environmental cost externalization as at that point the economy runs only on socio-environmentally polluting sources of energy SEPES as shown by the blue SEPES arrow going from left to right.

Moreover, Figure 2 above can be used to derived the following from the sustainable development market world; i) there is a tool transition problem TTP as they are no transition tools as indicated by the broken black arrow from IRHUBLGW to TTP, ii) there is no clear goal

to transition to socio-environmentally clean economies or socio-environmental pollutionless markets as indicated by the broken gold arrow going from right to left from IRHUBLGW to IRHUBLE, iii) it is a world where having a full supply of no socio-environmentally polluting sources of energy NSEPES is not a priority as there is no incentive to close the socio-environmental pollution reduction technology gap SEPRTGP as indicated by the broken red arrow going from right to left, and iv) there is a socio-environmental pollution reduction technology gap problem SEPRTGP affecting it as indicated by the broken SEPRTGP arrow going from right to left.

We can point out the no transition nature or the permanent socio-environmental market failure situation of the 1987 sustainable development market tool (SDM) in Figure 2 above by looking at nature of the remaining socio-environmental pollution production RSEPOPP when sustainable development markets are set up as at point 1 on the vertical 1987 blue line and when sustainable development markets expands such as point 2 and point 3. When sustainable development markets SDM are set up they address some of the socio-environmental pollution production problem SEPOPP equal to the distance from point "a" to point 1 in Figure 2 above, which leaves a remaining socio-environmental pollution production problem RSEPOPP indicated by the distance from point "1" on the 1987 SDM tool to point "b" as shown by the ongoing black arrow at the top of Figure 2 above from point 1 to point "b". When the sustainable development market SDM expands from point 1 in 1987 to point 2 on T2 and then from point 2 to point 3 on T3 it still has a remaining socio-environmental pollution problem RSEPOPP, equal to the distance from point 1 to point 2 in the first expansion to T2; and equal to the distance from point 2 to point 3 in the second expansion to T3, showing that sustainable development markets work under socio-environmental market failures, which affects their sustainability. In other words, as sustainable development markets are created and when they expand they still display a remaining socio-environmental pollution production problem. And the above situation shows that sustainable development markets SDM are no transition tools aimed at addressing a portion of the consequences of irresponsible human behavior led economies (IRHUBLE), not at fixing the root-cause of the socio-environmental pollution production problem embedded in those irresponsible economies (IRE).

Stating the anthropocentric critical socio-environmental problem solving possibility point

Notice that if we fully internalized socio-environmental costs of production (SEM = SM + EM), then the model shift from irresponsible (IR) to responsible (RE) as now there is a clear goal to transition to socio-environmental pollutionless economies as then socio-environmental pollution reduction problem becomes a good profit making opportunity that allows true sustainability market TSM transition to the socio-environmentally clean economy creating in the process a critical problem possibility point at point "b" as stated in Figure 3 below.

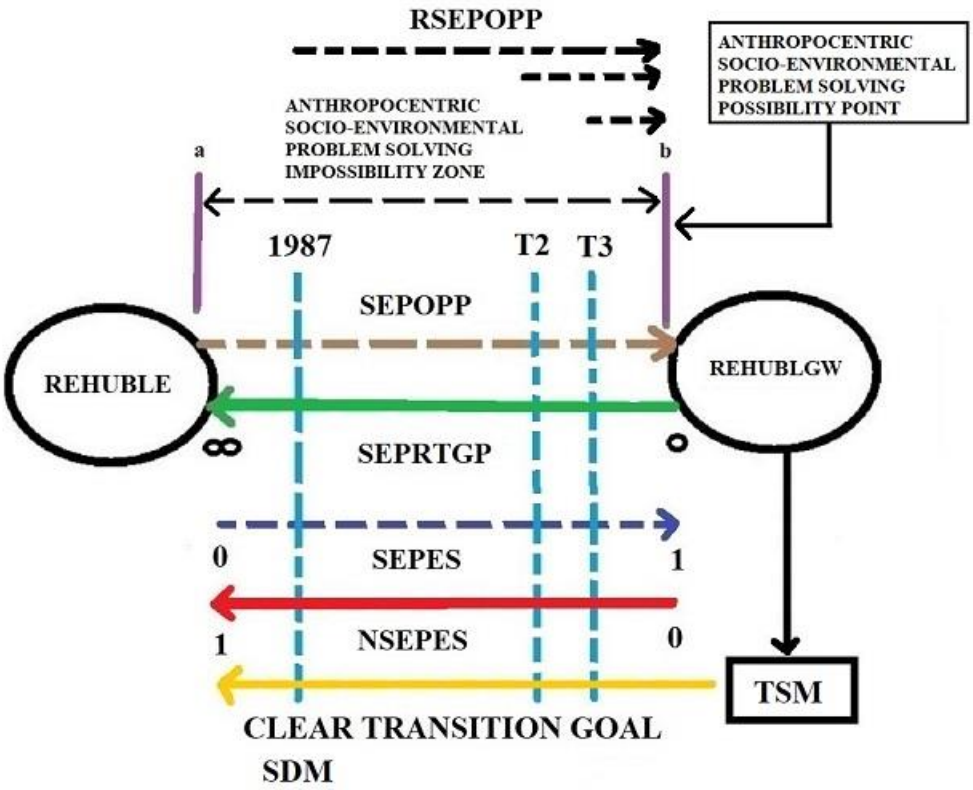

Figure 3 The structure of the anthropocentric critical socio-environmental problem-solving possibility point

It can be seen based on Figure 3 above that at point "b" there is an anthropocentric socio-environmental problem solving possibility point (ASEPSPP), and here there is no longer a socio-environmental pollution production problem SEPOPP as well as there is no remaining socio-environmental pollution problem RSEPOPP as the result of full socio-environmental cost internalization. See that now at the critical socio-environmental problem solving possibility point "b" (ASEPSPP) in Figure 3 above we can appreciate the following: i) there is a clear transition goal to go from irresponsible socio-environmental human behavior led economy IRHUBLE to a responsible socio-environmental human behavior led economy RSEHUBLE transforming irresponsible socio-environmental human behavior led global warming IRHUBLGW to a responsible one RSEHUBLGW, ii) this move towards responsible socio-environmental behavior (RSEHUB) provides now incentives to close the socio-environmental pollution reduction technology gap problem SEPRTGP producing the no socio-environmental polluting sources of energy NSEPES needed to permanently substitute the polluting sources of energy SEPES; iii) there is now a proper transition tool set up a la true sustainability markets TSM so it can be transitioned by slowly but surely producing at the lowest socio-environmental market price possible, and iv) this allows the case of making money while reducing socio-environmental pollution to the point where the true sustainability market price TSMP equals the socio-environmentally clean market price SECLMP so that TSMP = SECLMP to become now a permanent socio-environmental pollutionless market or socio-environmentally responsible economy RSEHUBLE as shown by all continuous arrows from right to left in Figure 3 above.

Notice that the possibility point at point “b” (ASEPSPP) breaks the impossibility zone that exist from point “a” to point “b” as a direct result of full socio-environmental cost internalization.

Finally, it is important to stress that in Figure 3 above point “b” (ASEPSPP) is now a point of full socio-environmental cost internalization; and see that point 1 on the vertical 1987 blue line of the sustainable development market SDM no longer has a remaining pollution production problem so the distance from point “a” to point “b” is now broken as the is no longer a socio-environmental pollution production problem SEPOPP as it has been internalized and the distance from point “1” to point “b” is broken too as there is no longer remaining socio-environmental pollution production problem linked to and affecting the working of the true sustainability market. In other words under true sustainability markets TSM there are no longer socio-environmental sustainability gaps or remaining socio-environmental pollution production problem, and hence, there are no longer remaining sustainability gap problems.

The structure of the anthropocentric critical socio-environmental problem-solving impossibility zone for sustainable development markets

The critical socio-environmental problem solving impossibility zone (ASEPSIZ) under which sustainable development markets SDM operate then can be stated as indicated below in Figure 4:

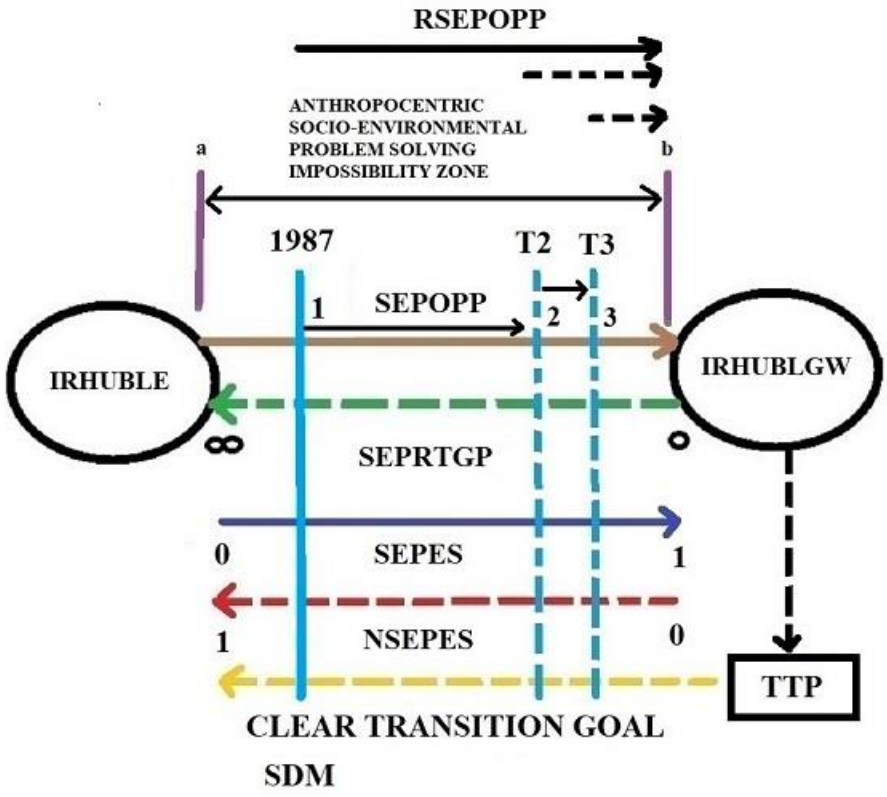

Figure 4 The anthropocentric cricial socio-environmental problem-solving impossibility zone for sustainable development markets (SDM)

Figure 4 above points out that when sustainable development market tools SDM are at work i) there is still a remaining socio-environmental pollution production problem RSEPOPP that goes from point 1 to point "b"; ii) They run using socio-environmentally polluting energy sources as indicated by the continuous blue line; and iii) they are stuck in a socio-environmental market failure at point 1 and when they expand at each sustainable development market positions there is a remaining socio-environmental pollution production problem attached. Notice that the broken arrows in Figure 4 above show what sustainable development markets lack: i) They have a fully open socio-environmental pollution reduction technology gap problem SEPRTGP as indicated by the broken green arrow; ii) They do not have a clear goal to transition to socio-environmentally clean economies as indicated by the broken gold arrow; iii) they do not have a supply of no socio-environmental polluting sources of energy NSEPES as indicated by the broken red arrow; and iv) they do not have a proper transition tool to socio-environmentally clean markets as shown by the broken down black arrow from IRHUBLGW to TTP.

Implications related to implementing no transition tools such as sustainable development markets to address the critical socio-environmental pollution production problem embedded in Figure 4 above

a) A shift from fully socio-environmentally dirty markets to socio-environmental pollutionless markets is not possible

Consistent with the discussion above based on Figure 4, as sustainable development markets are stuck in a permanent socio-environmental market failure at point 1 or at any expansion point, then they cannot be transitioned towards socio-environmentally pollutionless markets, a situation pointed out in Figure 5 below:

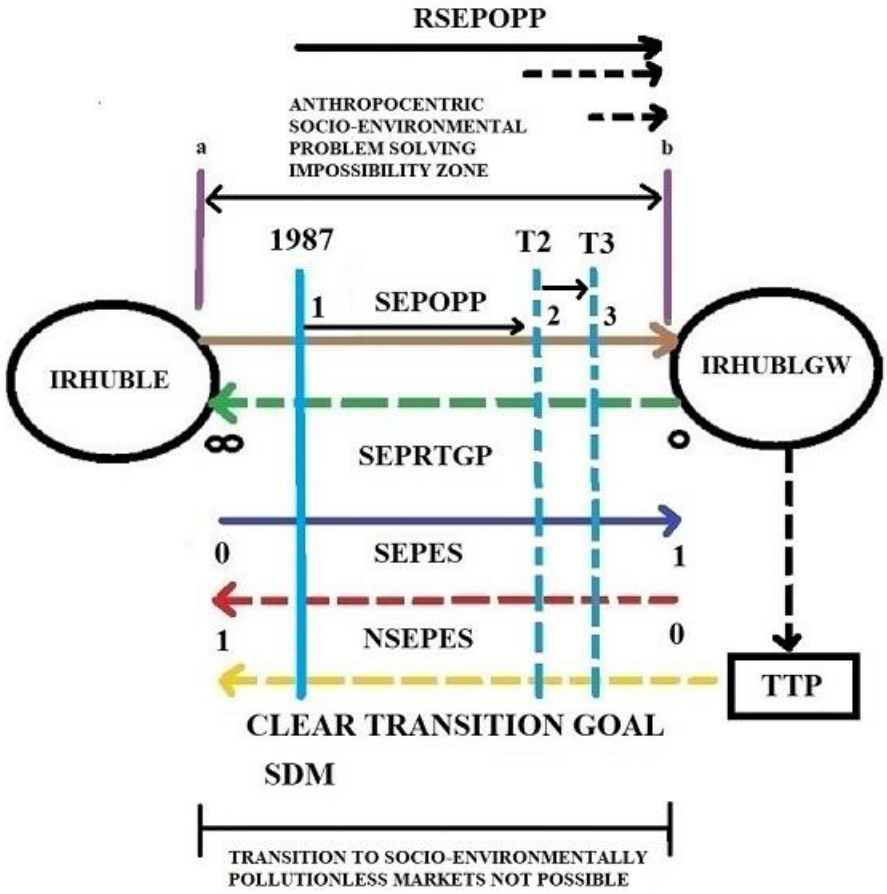

Figure 5 Sustainable development markets (SDM) as inappropriate tools to address the critical socio-environmental problem-solving as it resides inside the impossibility zone

Figure 5 above tells us that in sustainable development markets SDM, transition to socio-environmentally clean economies is not possible as they are stuck under socio-environmental market failure producing and consuming at point 1 or at any point on the socio-environmental pollution production problem arrow when they expand and expand. Also notice that the continuous blue line indicates that sustainable development markets are running only on socio-environmental polluting energy sources SEPES.

b) A world under possible and unbearable economy black outs is possible

As sustainable development markets operate under socio-environmental polluting energy sources SEPES, and they have no supply of no socio-environmental pollution sources of energy NSEPES, then if socio-environmentally polluting energy sources suddenly disappear there will be socio-environmentally led economy black out with the possibility of unbearable socio-environmentally led economy black outs leading to economy collapses depending of the nature of the socio-environmental pollution reduction technology gap problem SEPRTGP as shown in Figure 6 below:

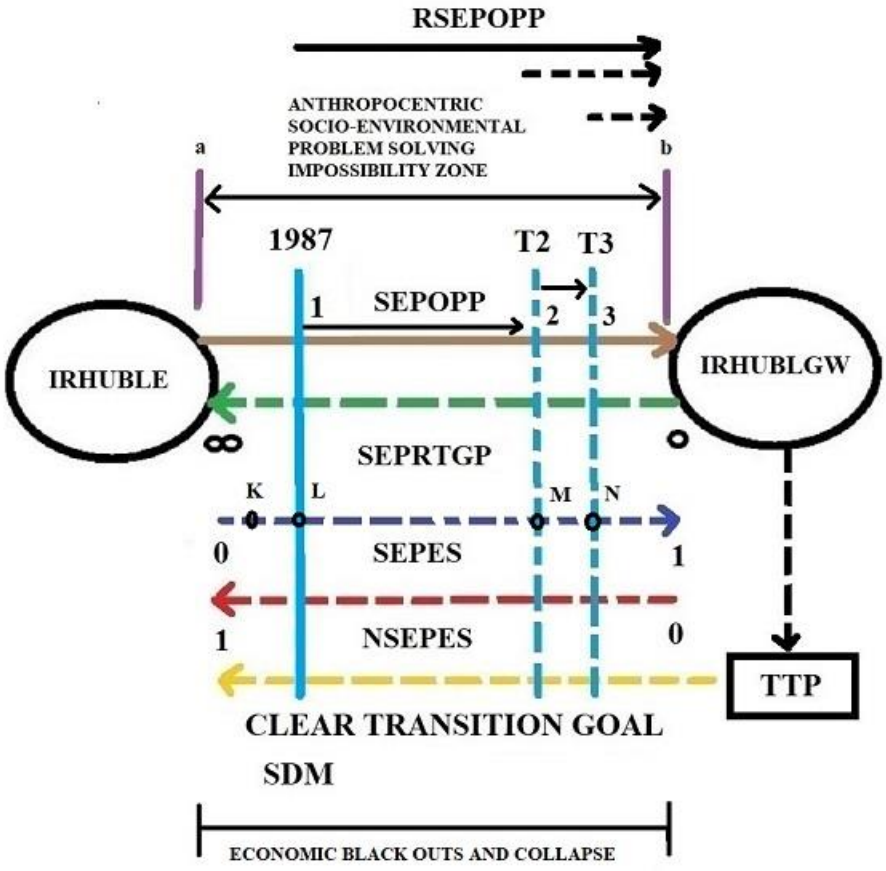

Figure 6 The world under economic black outs when socio-environmentally polluting energy sources suddenly disappear when the socio-environmental pollution reduction technology gap problem has not yet been addressed.

Figure 6 above shows the situation sustainable development markets SDM are in when the socio-environmental pollution sources of energy SEPES it is using to operate suddenly disappear as indicated by the broken blue line. Notice that the socio-environmental pollution production problem SEPOPP disappears if the socio-environmental polluting sources of energy SEPES disappear as indicated by the broken EPOPP arrow and as there is not a supply available of no socio-environmental pollution energy sources NSEPES, then there will be economic black outs and economy collapses.

For example, if the sustainable development market SDM is operating at point 1 it requires socio-environmentally pollution energy sources SEPES at the level of point L on the broken blue line, then a) if the socio-environmental polluting source of energy SEPES disappear at that point L there will be an economy collapse as there is are no sources of no socio-environmental polluting energy to pick up the fall as the socio-environmental pollution reduction technology gap problem is wide open; and b) if the socio-environmental polluting energy sources SEPES disappear at point K, then there would be initially economy black outs, but without no socio-environmental polluting sources of energy NPES to pick up the gap, there will be soon an economy collapse. If the socio-environmental polluting energy sources SEPES disappear suddenly to the right of point L, there is no energy available for economic expansions to point 2 and to point 3, and then later without energy available to keep the economy running the sustainable development market at point L will collapse.

Implications related to implementing proper transition tools such true sustainability markets TSM to address the critical socio-environmental pollution production problem embedded in Figure 3 above

a) A shift from fully socio-environmentally dirty markets to socio-environmental pollutionless markets is possible

Consistent with the discussion above based on Figure 3, as true sustainability markets TSM are proper transition tools then it is possible to transition them towards socio-environmentally clean markets or socio-environmental responsible human behavior led markets RSEHUBLE as highlighted in Figure 7 below:

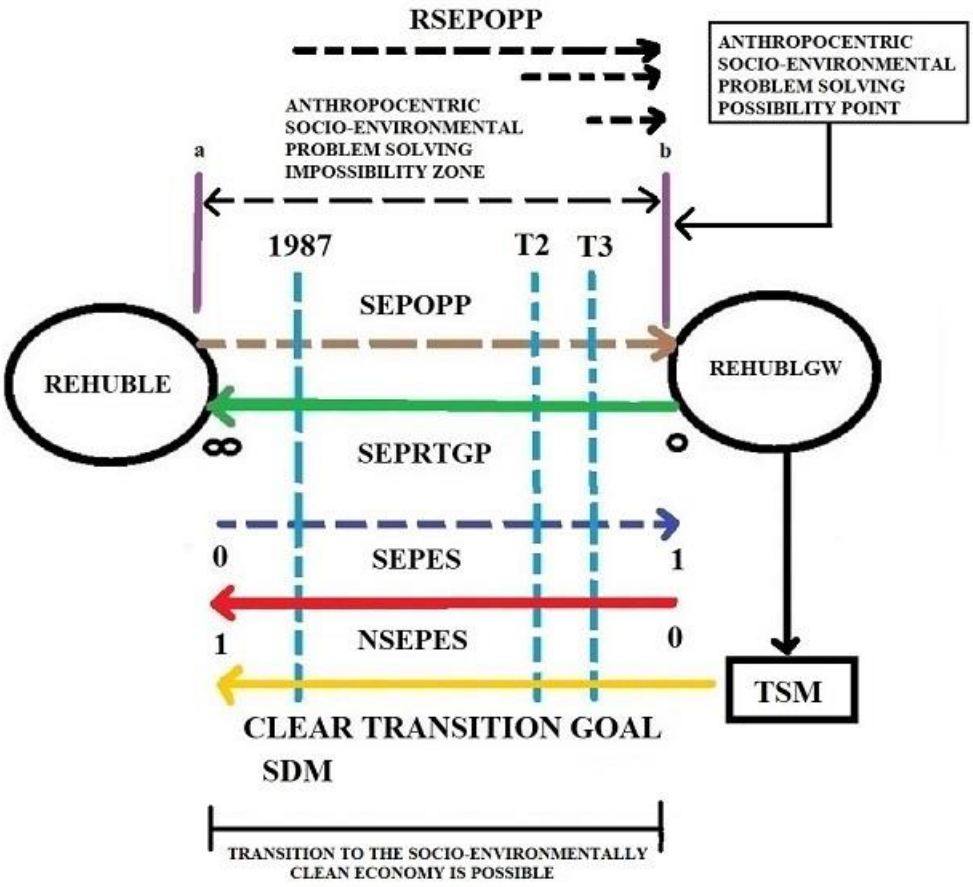

Figure 7 True sustainability markets (TSM) as the appropriate transiton tool at the anthropocentric critical problem-solving possibility point

Notice now that since in Figure 7 above there is a clear transition goal to bring the market from point "b" towards the socio-environmentally responsible human behavior led economy RSEHUBLE as indicated by the continuous golden arrow, using true sustainability markets TSM as the transition tool. See in Figure 7 above too, that now the socio-environmental pollution reduction technology gap SEPORTG is closed as indicated by the continues green arrow going from RSEHUBLWG to RSEHUBLE, and you can appreciate too in Figure 7 above that since now socio-environmentally polluting sources of energy NSEPES have permanently substituted socio-environmentally polluting energy sources SEPES there is no longer an external socio-environmental pollution production problem as indicated by the broken SEPOPP arrow.

Hence Figure 7 above shows the conditions under which transition to the socio-environmentally clean economy is possible as a permanent fix to the socio-environmental pollution production problem, which are: i) Set a clear transition goal towards socio-environmental pollutionless markets; ii) Set up true sustainability markets; iii) invest in fully closing the socio-environmental pollution production technology gap; and iv) transition the true sustainability markets towards socio-environmentally clean market by a process of substituting permanently socio-environmentally polluting energy sources by no socio-environmentally

polluting ones to be able to produce at the lowest true sustainability market price possible until full transition happens at the point where the true sustainability market prices equals the socio-environmentally clean market price. Finally notice that at the possibility point "b" (ASEPSPP) when the socio-environmental pollution reduction technology gap SEPRTGP is closed, there are no remaining socio-environmental pollution production problems as the broken RSEPOPP arrow on top in Figure 7 above shows.

b) A world under possible but sometimes bearable economy black outs is possible

The possibility of economy black outs in the transition process from true sustainability markets to socio-environmentally clean markets if socio-environmental polluting energy sources disappear suddenly is still there, but the closer we are at closing the socio-environmental pollution reduction technology gap problem SEPRTGP when this happens, the more bearable economy black out are as they become extra incentive to close the remaining socio-environmental pollution reduction technology gap even faster as opportunities for further reducing pollution production come along, which means incentives to seek lower true sustainability market prices to maximize true sustainability market based profits, a situation that can be appreciated with the help of Figure 8 below:

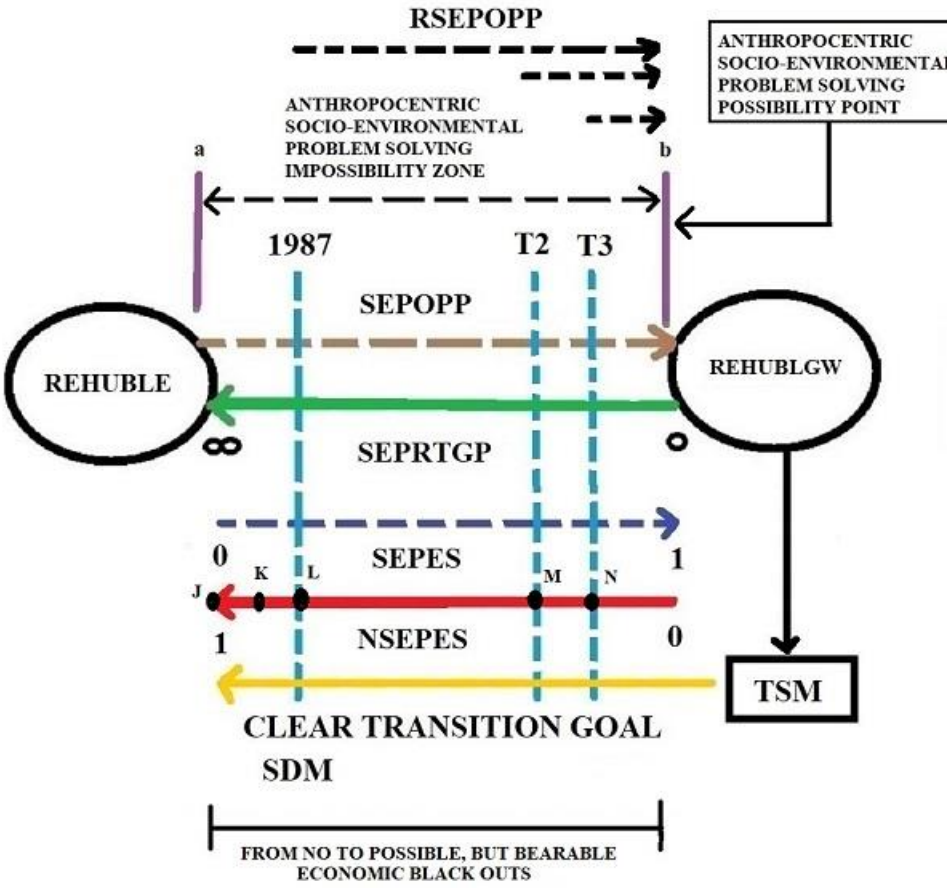

Figure 8 Transitions to socio-environmentally clean economies and economic black outs

Figure 8 above depicts the world under the anthropocentric socio-environmental problem solving possibility point (ASEPSPP) where economy black out are possible if socio-environmentally polluting energy sources SEPES suddenly disappear as indicated by the broken blue SEPES arrow, but all depends on the state of the renewable energy technology gap at that moment. For example, a) if the transition to the environmentally clean economy is at point "J" when the renewable energy technology gap is closed there will be no economy black outs if environmental polluting energy sources disappear suddenly; b) if the transition to the environmentally clean economy is at point "K", a dominant true sustainability based economy exist, then there may be economy black outs, but they would be bearable as they would provide incentives to true sustainability market producers to go the extra mile and close the remaining socio-environmental pollution reduction technology gap problem faster and make more money generating even lower true sustainability market prices; and c) if the transition to the socio-environmentally clean economy is at point "L" or worse at point "M" and at point "N" when socio-environmental polluting sources of energy disappear we should expect economy black outs first and economy collapses soon after as not enough socio-environmentally based clean energy is around to support those levels of economic activity in the absence of SEPES sources.

Hence, figure 8 above shows i) the structure of the critical socio-environmental problem solving possibility point; ii) the possible transition route; and iii) the requirements to transition from socio-environmentally irresponsible human behavior based economies to socio-environmentally responsible human behavior ones.

The socio-environmentally based future we needed to construct to fix the socio-environmental pollution production problem in 1987.

Notice that Figure 8 above highlights a future where we close the socio-environmental pollution reduction technology gap problem while socio-environmentally polluting energy sources are still around, and set the goal to close it way before those socio-environmentally polluting energy sources are exhausted, this is the socio-environmentally based energy future we needed to construct in 1987, but we did not, which is indicated in Figure 9 below:

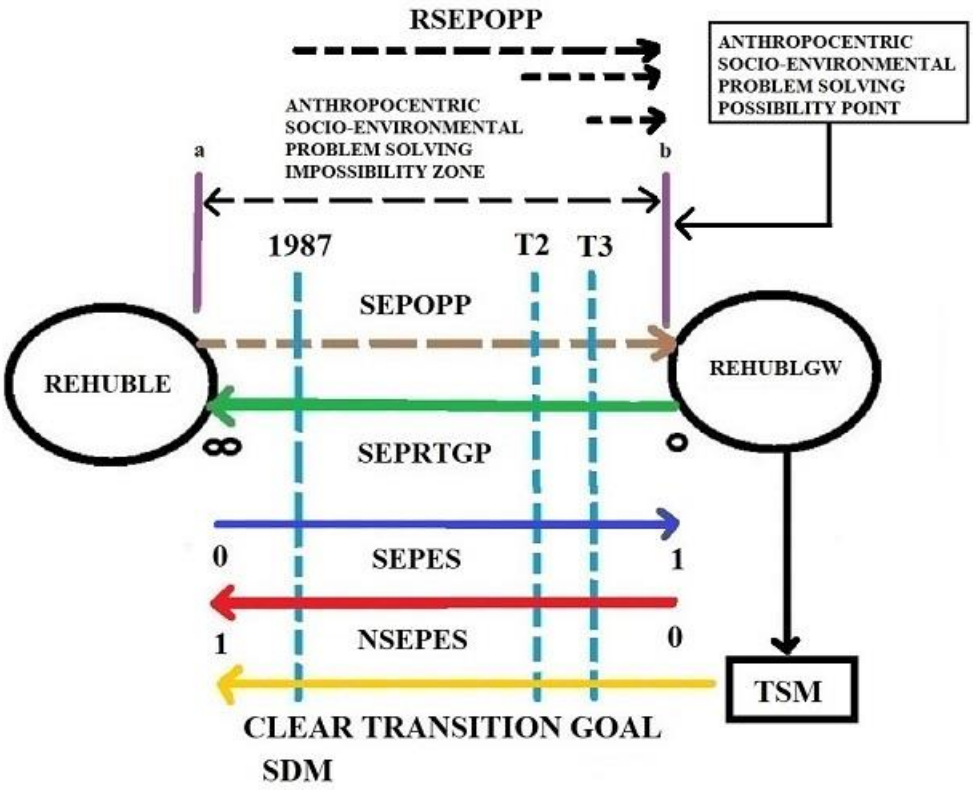

Figure 9 The socio-environmental future we should have constructed in 1987: Closing the socio-environmnental pollution reduction technology gap SEPORTG while the socio-environmental polluting sources of energy are still araund

The critical socio-environmental problem solving possibility point at point "b" in Figure 9 above indicates that to fix the socio-environmental pollution production problem SEPOPP in 1987 we need to construct a socio-environmental responsible future where: i) The priority goal is to transition towards socio-environmentally responsible human behavior led economies or socio-environmental pollutionless markets; b) To set up true sustainability markets as the proper tool for such a transition; c) to invest in closing the socio-environmental pollution reduction technology gap problem to permanently leave behind socio-environmental polluting sources of energy; and c) the faster we close this SEPRTEGP gap problem the easier would be to avoid economy black outs and collapses.

Notice that this effort requires serious shift in thinking and acting, for example we have to shift from macroeconomic and microeconomic thinking to true sustainability based economics and true sustainability based microeconomic thinking to handle socio-environmental sustainability based market problems, we have to shift education programs at all levels kindergarten to university; and gear them towards socio-eco-economic codependent choices, and we have to have governments that stay outside true sustainability markets unless there is a true sustainability market failure so that true sustainability based producers and true sustainability based consumers assume the socio-eco-economic responsibility that comes with leaving the old

traditional economy thinking behind and move to a new world under full component codependence.

The socio-environmentally based future we needed to avoid in 1987, but we did not, exacerbating the global warming or critical problem issue while addressing it

See that Figure 7 above stresses the socio-environmental future we should have avoided in 1987 or not wanted, but we did not avoid it, we took it, a world under socio-environmentally polluting sources of energy with no interest in closing the socio-environmental pollution reduction technology gap problem, as this future will lead to economic black outs sooner or later if alternative no socio-environmentally polluting energy sources are not readily available when socio-environmentally polluting sources of energy are suddenly no longer around or are left behind, for example due to resources exhaustion or wars or deep socio-environmental policy, a situation described in Figure 10 below:

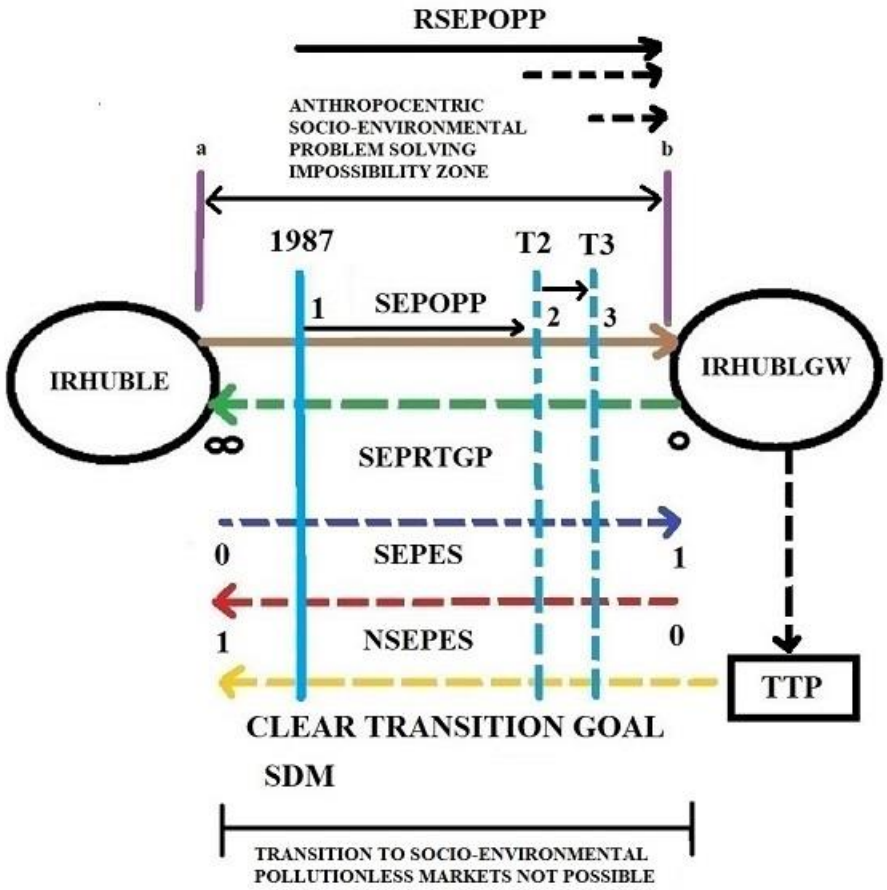

Figure 10 The future we should have avoided in 1987: Having socio-environmental polluting sources of energy disappear while the socio-environmental pollution reduction technology problem has not been addressed or closed

Notice that the situation indicated in Figure 10 above, a world with a full socio-environmental pollution reduction technology gap problem SEPORTGP, is the same one where sustainable development markets SDM are set up, a world with no transition route to socio-environmentally clean markets; and a world of possible economy black out if tomorrow there are no more socio-environmental polluting sources of energy available as we lack the supply of no socio-environmental polluting energy sources to make up for their absence as closing the socio-environmental pollution reduction technology gap in sustainable development markets is not a good business opportunity for sustainable development based producers and sustainable development based consumers.

The implications for past and current critical socio-environmental pollution production problem solving actions implemented since 1987

Closing the socio-environmental pollution production technology gap was not and it is not a goal in sustainable development thinking a la 1987 WCED(WCED 1987); it is not the goal in dwarf green market thinking a la 2012 UNCSD too (UNCSD 2012a:UNCSD 2012b), and it is not the goal of circular traditional market thinking a la EUROPE also (WB 2022) so all those no transition tools would not work in the impossibility zone and eventually when socio-environmentally polluting energy sources disappear there will be economy black outs as there would not be no socio-environmental polluting energy sources ready available to cover that gap to keep those economies running efficiently. The greater the socio-environmental pollution reduction technology gap problem is, the greater the risk of economy black outs in case of as sudden lack of socio-environmentally polluting sources of energy.

It seems to be important to point out that wars seem to increase the risk of economy black outs under an open socio-environmental pollution reduction technology gap problem as they can suddenly limit or cut all together access to socio-environmental polluting energy sources, requiring more expensive adjustments that if we have invested heavily in transitioning to the socio-environmentally clean economy from 1987 or from 2012 or from 2023, and by endorsing the future we needed to avoid, but we did not, we are favoring in the process the development and wealth of the owners of the socio-environmental polluting sources of energy instead of encouraging a new wave of owners and wealth of no socio-environmental pollution sources of energy.

Food for thoughts

a) Should we expect economy black outs if the socio-environmental pollution reduction technology gap is never closed and socio-environmental polluting sources of energy suddenly disappear? I think yes, what do you think? b) Can you truly fix a sustainability problem with a patch? I think No, what do you think? c) Can economies collapse in front of our eyes if we use a

socio-environmental patch forever? I think yes, what do you think? d) Should a world under socio-environmental clean market be a human right? I think yes, what do you think? e) Would a total socio-environmental system collapse make a full socio-environmental cost internalization policy be politically palatable? I think yes, what do you think?

Conclusions

First, it was highlighted that socio-environmentally irresponsible human led economic behavior has been driving socio-environmentally irresponsible behavior led global warming through an ongoing negative socio-environmental pollution production loop. Second, it was pointed out that the socio-environmental pollution problem that separates socio-environmentally irresponsible economic behavior and socio-environmentally irresponsible global warming trends can be fixed and it can be patched. Third, it was pointed out that all the patches such as the sustainable development patch, dwarf green market patches, and circular economic thinking which is neither a pollution production problem patch, but a resource use inefficiency patch, fall within the anthropocentric critical problem-solving impossibility zone, which means they will never be able to fix the socio-environmental problem they are supposed to be or appear to be addressing as there is still a remaining socio-environmental pollution problem affecting the sustainability of the no transition tool as they work. Fourth, it was highlighted that the socio-environmental pollution problem can only be fixed if we use proper transition tools towards socio-environmentally clean markets such as the use of true sustainability markets, but the fix in this case must state clearly that the goal is to transition towards socio-environmental pollutionless markets, for which we need to close the socio-environmental pollution reduction technology gap problem so as to be able to permanently substitute socio-environmentally polluting energy sources by no polluting ones. Fifth, it was pointed out that when we use no transition tools to deal with the socio-environmental pollution production problem then there is no path to transition to socio-environmentally clean economies as they operate under permanent socio-environmental market failure, and if socio-environmentally polluting sources of energy disappear suddenly, due to exhaustion or war and so on, there will be economy black outs as the socio-environmental pollution reduction technology gap is not closed; and there is no supply of no socio-environmentally polluting energy sources is available to make up for that SEPES fall. Sixth, it was stressed that when we use proper transition tools such true sustainability markets TSM there is a path towards socio-environmentally clean economies as they operate freely producing at the lowest true sustainability market price (TSMP) possible until the true sustainability market price becomes the socio-environmentally clean market prices (SECLMP) with a socio-environmental margin (SEM = SM + GM = 0) of zero so that TSMP = SECLMP, where SM + EM = 0 since here SM = EM = 0), where SM = social margin and EM = environmental margin. Seventh, it was indicated that when the socio-environmental technology gap problem is fully closed and suddenly socio-environmentally polluting energy sources disappear there are no economy black outs, but if socio-environmentally polluting sources of

energy disappear just before the socio-environmental pollution reduction technology gap SEPORTGP is closed, then the economy black outs provide last push for incentives to fully close the technology gap as rapidly as possible as now socio-environmental pollution reduction is a good profit making opportunity. And when the socio-environmentally technology gap is too wide such as when you are in a dominant socio-environmentally polluting energy based economy and socio-environmentally polluting sources disappear, there will be economy black outs and then collapses. Eight, in general it was shown that the socio-environmentally responsible world we needed to construct, but which was not constructed in 1987 is the one where there are no socio-environmental pollution reduction technology gaps and we can run economies using fully no socio-environmentally polluting energy sources, making them fully socio-environmentally friendly based economies; and that the world we need to avoid, but we actually took in 1987, is the world we are living in since 1987 WCED, where the world runs on socio-environmentally polluting energy sources and where closing the socio-environmental pollution reduction technology gap problem or the idea of the need to transition to socio-environmentally clean economies does not make it even as a goal: The transitioning to socio-environmentally clean economies should have been the first goal since 1987 if fixing the socio-environmental pollution production problem was the aim, but since this goal is not even a sustainable development goal means that sustainable development tools are just no transition patches or tools.

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