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Extra-Terrestrial Settlements**

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BLOCKCHAINS AND EXTRA-TERRESTRIAL NATIONS: ROLE OF BLOCKCHAINS IN THE SOCIO-POLITICAL MILIEU OF FUTURE EXTRA-TERRESTRIAL SETTLEMENTS

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ABSTRACT

Humanity is on the cusp of a great wave of space exploration and colonization of Extra-Terrestrial Bodies (ETB). This paper deals with the socio-political issues that may arise between earth and E.T Settlements and the possible ways to resolve them.

Firstly we discuss as to how early maritime explorations compare to present day space voyages. Based on the lessons learnt we will analyse the socio-political relation between Earth and Extra-Terrestrial Settlements (ETS) and how some possibilities of conflicts can arise.

We then evaluate as to how Blockchain systems can potentially keep earth and ETS tethered to each other and provide a way for harmonious co-existence.

The paper concludes by summarizing the possible Socio-Political and Economic conflicts between Earth and future ETS and ways to resolve them.

INTRODUCTION

A cryptocurrency is a medium of exchange using cryptographic techniques to safeguard transactions and also manage the formation of additional units of the currency. A Blockchain is a widely disseminated archive of data that maintains a continually-expanding register of records fully and reliably protected from any alteration or modification. Each block has a timestamp and link to the preceding block. A Crypto

wallet is an encrypted electronic device that allows an individual to make electronic cryptocurrency transactions.

Each wallet will have a public key visible to anyone. But it can be operated by only a person who has a private key. Transactions on the cryptocurrency network are usually anonymous. When people send cryptocurrencies to each other, someone has to keep account of who spent how much at what time. In case of fiat money (or paper money) it is done by banks (known as Trusted Third Parties, for which they charge a commission). But in case of Cryptocoins, it is registered on a ledger called Blockchain (with nil or minimal fees).

The cryptocurrency network makes this possible by detailing all the transactions made during a certain timeframe into a list. This list is known as a block. A certain set of people called 'miners' verify these transactions mathematically and register them on the Blockchain. Those bona-fide miners who have successfully verified the transactions are paid freshly created Cryptocoins. This is how miners are rewarded, and new cryptocurrencies are generated. This is also the reason why no transaction costs are levied, as the network (in the form of miners) verifies the transactions.

Bitcoin is a peer-to-peer based cryptocurrency which is not backed by any commodity and (unlike fiat money) carries no sovereign guarantee whatsoever. Regulated and Sovereign Backed Cryptocurrencies (RSBC), on the other hand are government backed cryptocurrency akin to paper currency, but in digital form.

In this system, the cryptocurrencies (known as NationCoins) are backed by Sovereign Guarantee. They are run on a highly secure Controlled Blockchain (CBC). NationCoins are completely managed by the Sovereign Authority i.e. the Government. This system is based on the K-Y Protocol ^[1]. The K-Y Protocol is a set of rules and instructions to implement the Regulated and Sovereign Backed Cryptocurrency (RSBC) system ^[2].

It is expected that by the 2030s, humans will have landed on Mars ^[3], from the time that humanity landed on the moon; there have been speculations that man will someday colonize and have a permanent settlements there. Mars, having many conditions similar to that of Earth would be a logical next step. Since the last moon landing in 1972, there has been considerable interest in going back to the moon and beyond. Various teams (both government and private) have been studying, researching and designing plans to go to Mars. Once man lands on Mars, a permanent settlement can be expected in the form of human habitations.

The present state of space exploration bears many similarities to the early days of European Sea Voyages and Explorations (ESVEs) in the 15th and 16th century A.D. Some of them are:

(1) Distance and Time: ESVEs had to cover thousands of nautical miles by sea (and sometimes by land). Present day space exploration will have to cover anywhere from hundreds of thousands of miles to several million miles in outer space. Though the distances are two or three orders of magnitude higher, the time taken will be the same. (e.g.; Time taken by Vasco-da-ga-ma on his first trip to India was around 10 months). A one way trip to Mars is expected to take 7 to 9 months. Therefore time taken for space voyages will be similar to early renaissance era maritime voyages.

(2) Communication: In ESVEs the success of a voyage was known only when one or all of the crew returned. Sometimes, they had to provide evidence of travel. There was no real-time communication of value between a sailed ship and its government. Once sailed, the crew were on their own.

In the present day, it will be possible to stay in touch with the space crew even with the time lag; an almost real-time communication link is possible (Time lag to Mars ranges from 4 to 24 Minutes). Moreover we already have artificial satellites around Moon and Mars to assist a future space crew.

(3) Lay of the land – Explorers in ESVEs had no idea how the seas or land would be. They had to experience it themselves to know it. They had no way of knowing what lay ahead. Mapmaking was in its infancy. E.g.: Columbus thought he had reached India when he had actually reached the Bahamas. But Space voyages will be well planned as we have an idea of the entity to be explored. Though explorers will face many new things, there are ways to at least discern as to what to expect once a crew successfully makes landfall in space.

(4) Physical and Environmental conditions – ESVE had the advantage that however far they went or however new the territories, they were still on Earth. Atmospheric conditions were more or less similar to their place of origin. Water and food was somehow available, so that explorers could live off the land or sea.

Space explorers will not have this advantage. And it is the most challenging aspect of space exploration. Though sailors suffered from rickets (Vitamin C deficiency) or other nutritional deficiencies on long voyages, space explorers will have to withstand much tougher physical conditions. Once they leave Earth, they will always find themselves in confined, pressurised spaces to keep themselves alive.

(5) Return journey- Once they had reached new lands, ESVEs, had to just restock their ships with supplies and set sail again back home. In case of space explorations, things get complicated as future astronauts will need a launching mechanism to launch them back home. This means they have to carry the return fuel with them from Earth. They cannot ‘restock’ their spacecraft with food, fuel or water. Everything has to be carried from here.

(6) Settlements and colonies- ESVEs used to sail in a convoy of ships (E.g.: of Christopher Columbus and his crew sailed in 3 ships-Santa María, Pinta and the Niña). Many a times, some of the crew would settle on the newly discovered territories. Sometimes it was deliberate government policy to settle faraway lands (Australia was a penal colony).

Space exploration may take a similar road. Mankind will have to someday settle extra-terrestrial bodies. But the manner in which it will be carried out remains to be seen.

We thus observe that barring a few exceptions, space exploration (manned) is similar to ESVEs. The major differences are that

(a) Humans cannot freely live off the land as done by ESVEs.

(b) There are incredible physical and environmental constraints and early settlers on Extra-Terrestrial Bodies may find it difficult to start the colonization process.

And once a self – sufficient colony becomes established, with births and deaths taking place on those Extra-Terrestrial Bodys, the question of legal status of the inhabitants of Extra-Terrestrial Bodys might emerge.

Will a baby born on mars be considered as a citizen of its parent’s nation(s), citizen of earth or mars?

If it is the latter, will mars be considered a ‘province’ of earth or a separate nation or an altogether new (presently undefined) entity?

Will Mars be considered a colony like the U.S.A or India was of Great Britain ?

Once there is a self-sufficient colony on Mars, will it pay ‘taxes’ to earth or to a particular nation that will lay claim to Mars due to its astronauts (or their descendants or ancestors) having been there?

The purpose of the above discussion is to analyse that present and near–future space exploration being similar to ESVEs, we can expect that the end results may also be similar i.e. future space settlements may develop into independent (and maybe autonomous) socio-political units (like 16th & 17th century colonies and settlements) setting a stage for an interaction between Earth bound and Extra–Terrestrial nations. It is pertinent here to note that an ET national unit may be around five or ten decades into the future. It may appear too early to speculate on its

probabilities. But the fact is that the analysis we do now and the decisions we take as mankind will decide whether our interaction with E.T national units will be confrontational or co-operative. The ability to do such analysis will also prepare us to have long term policies which will cement our self-esteem as a space-faring race (which can make policies that stand the test of time).

THE POLITICAL POSSIBILITIES OF A FUTURE E.T SETTLEMENT

Once an Extra-Terrestrial Settlements (E.T settlement) becomes self-sufficient in oxygen, water, and food; there is little reason for it to depend on earth for supplies. (Oxygen can be extracted from certain minerals on Extra-Terrestrial Bodies, and food can be grown once free water becomes available).

We need to have a system which will sort these questions out. Once successfully established, an E.T colony might provide earth with exotic resources hitherto unavailable. It may also open radical new areas of economic expansion. And considering the fact that humans born on Extra-Terrestrial Bodies might be slightly different than earth born humans (in a biological sense), the perception of each other (on both sides- Earth and the Extra-Terrestrial Body) as 'different' may be aggravated.

What if a self-sufficient Extra-Terrestrial Body breaks away from Earth's humanity?

Some may argue that Extra-Terrestrial Settlements have a right to break free from earth's 'enslavement'. But the future repercussions of this argument will be devastating, both for the Extra-Terrestrial Settlements and Earth's humanity.

(1) The Extra-Terrestrial Settlement may consider itself as 'other humanity' and its existence and social systems may be at cross-purposes with that of Earth. This will pit earth's humanity against Extra-Terrestrial Settlements causing an investment into resources that may perpetuate a conflict or a 'space arms race'

(2) Once a break has occurred, it will take additional resources to reconcile with each side bargaining with the other for ‘concessions’. This may cause additional loss of time and delay in space research.

(3) It may also happen that after a breakaway, E.T. humanity and earth’s humanity compete in a space race (akin to the space race between the former USSR & USA) and lot of positive developments may take place. But this will happen under the shadow of a possibly impending and devastating conflict. USA and USSR's actions were held in check due to Mutually Assured Destruction (M.A.D). Unlike earlier days, Earth’s humanity (or E.T humanity) may have no qualms in destroying the other as each planet/ E.T Body is separated from each other by vast distances and the after effects of war(like a nuclear fallout) will not affect the other. Mutually Assured Destruction will not be deterrent enough to prevent devastating conflict.

(4) In case of a future threat to earth or Extra-Terrestrial Settlements (e.g.: from comet or asteroid) Humanity can respond as a single entity if it stays united.

Another possible way to keep humanity whole is for the international comity of nations to legislate a ‘Right of Return’ where every human being, even if born on an Extra-Terrestrial Body has the right to come back to earth and settle here on earth during his/her lifetime. Similarly every human being born on earth will have a right to settle on any Extra-Terrestrial Body with a pre-existing human settlement.

AN INTERNATIONAL POLITICAL ARRANGEMENT FOR E.T EXPLORATION

Space exploration, let alone landing and colonization of E.T bodies are a costly undertaking. The estimated cost of a manned mission to Mars is greater than the GDP of a majority of nations. As such, manned missions to E.T bodies require that nations of the world should cooperate. The ISS was built through international cooperation ^[4]. CERN building the LHC was possible because of international cooperation.

Thus, manned mission to E.T bodies will most likely involve international collaboration on a big scale.

Once a manned mission is successful, we will need to move on to settlement and colonization.

For a settlement to flourish and become self-sustaining it needs to become economically viable. And for that to happen, it has to add value. How can a settlement add value? It can happen only if it produces a definite output that has value for people who can pay a price. Simply put, an E.T settlement has to provide something valuable that can be traded with earth so that it becomes economically viable.

Vasco-da-Gama's trip to India was commercially successful, which made it affordable to send more expeditions ^[5].

Similarly a manned mission to Mars should be economically viable in order for humanity to continue sending expeditions to Mars/Moon and colonize them. In short an E.T Body has to pay for its own colonization.

In this regard, there are a few models that can be followed. The question to be answered here is—should the E.T. Body be commercially exploited or should, it be used purely for scientific and research purposes only?

THE ANTARCTIC MODEL

The Antarctic model may appear to be a viable model to emulate.

Antarctica has no permanent human native population and therefore has neither citizenship nor government. All people present on Antarctica at any given time are citizens, residents or nationals of some dominion outside Antarctica, as there is no Antarctic sovereignty.

The Antarctic Treaty is considered to signify the model of a common principle of heritage of mankind.

But it might not be feasible for following Antarctic treaty model fully when colonizing E.T bodies.

This is because:

(1) E.T bodies have so far not known to contain life. Therefore concept of commercially exploiting E.T bodies is in no danger of harming any life.

(2) E.T bodies cannot be used as waste dumping grounds as it is too costly to ferry waste for sole purpose of dumping them.

This logic applies to Antarctica as it is part of Earth's ecosphere (i.e. Bio, hydro, atmosphere etc.) and hence any pollution of Antarctica will have an impact on our lives. But Mars or Moon is in no way part of our ecosphere.

(3) Antarctica is not commercially exploited due to environmental concerns. But E.T bodies can be commercially exploited as they are not connected to Earth's ecosphere.

The one feature that from the Antarctic treaty that can be applied to E.T bodies is the sovereignty status of the E.T bodies. They should be considered as property of all humanity and not that of any one nation.

If we evaluate the value addition process of an E.T settlement, we find that the following hold true:

(1) Early settlements on Moon/Mars may have activities limited to growing food and conducting research. It is not economically feasible for Martian grown food to be exported to earth as costs will be too high.

(2) Minerals and ores being transported to earth is also not a valid economic proposition for the same reason. (Save except in cases where the commodities are highly precious metals/ commodities like diamond, platinum, iridium etc. which can be extracted at a very low cost and transported to earth in research bound space crafts on return journeys).

(3) There will be no secondary sector of manufacturing to speak of in the initial days of settlement.

(4) The number of tradable entities that an ET settlement can provide in its early days is thus limited to-

(a) Research data – Research data about the E.T. Body will be the primary purpose for a manned E.T Body mission. Space agencies and /or governments can pay a certain fee for the research data obtained from the manned missions. Private companies/governments involved in the projects may argue (rightfully) that research data of E.T Bodies are the end products of their capital investment i.e. manned ET Body mission. Thus, initially for a few years, research data may have to be provided on a no–cost basis until capital costs are recovered.

(b) E.T settlements can be used as launch pads to launch missions into deep space. This will be possible in medium term once the settlements have grown enough to build rockets, satellites and spacecraft's. Governments can pay a fee for such services.

(c) E.T Cryptocurrencies – Machines on E.T Bodies will be part of an E.T Blockchain network. They will have microprocessors which can conduct ‘SMART’ mining of E.T cryptocurrencies ^[6]. These cryptocurrencies can be used by early settlers as entropic money ^[7] for transactions between themselves and/or with earth. Such cryptocurrencies can be traded on crypto exchanges here on earth. This can become a viable source of funding and revenue to sustain E.T settlements and plan future missions (manned or unmanned)

This source of revenue (i.e as mentioned in (c)) appears to be the most feasible and workable solution in the short and medium term to make the settlement economically viable.

We can observe that future manned missions to ET bodies need to be based on international cooperation with a purpose to become commercially viable so as to be sustainable and have optimum development.

A future repeat of the ‘Boston Tea Party’ or ‘Sepoy Mutiny’ (of 1857) like scenario on Extra-Terrestrial Bodies leading to a cut-off of all contact and interaction with earth will be devastating to humanity. This is because, any act of political secession will cause a rift of ‘humanity’ as a whole resulting in two ‘humanities’, each politically, socially, territorially and (most significantly), biologically different from the other. Once cracked, it will be immensely difficult to reconcile the two humanities with each other as with subsequent generations, evolution will lead to a divergence that will be tough to bridge.

Once separated, an Extra-Terrestrial Settlements will no longer belong to the Earth’s Comity Of Nations – a concept that, for a long time has defined the notion of humanity as a whole.

(*Banning of births on Extra-Terrestrial Bodies appears to be a proposition which can stem the rise of the ‘other’ humans. (i.e. humans not born on earth). But it is both unviable and unethical when viewed from the point of view of human rights. We cannot expect to replenish populations of Extra-Terrestrial Settlements from earth in perpetuity. This will tend to slow down the pace of space exploration. Moreover the resources needed from earth will also be substantial. Additionally by banning E.T. births, we are discounting the ‘Right to reproduce’ of the astronauts who are willing to go to the frontiers of space research.)

We thus need to have a system that will-

- (a) Provide a seamless bridge between Extra-Terrestrial Settlements and earth in a political and economic sense.
- (b) Allow Extra-Terrestrial Settlements to function fairly autonomously (politically and economically) yet provide a connect to earth’s humanity.

We thus have to find a way in which power (political) should not be centralised with earth (which is very difficult to maintain due to time lag and distance issues) at the same time the self-governing style of Extra-Terrestrial Settlements should be acceptable to and considerate of Earth’s concerns.

One such system that might fulfil the above criteria may possibly be Blockchain technology- as they provide a decentralised yet consensus based platform for various functions.

USE OF BLOCKCHAINS IN EXTRA-TERRESTRIAL SETTLEMENTS

Use of cryptocurrencies in space and Extra-Terrestrial Settlements has already been envisaged ^[8].

Some of the significant uses of Blockchain technology in Extra-Terrestrial Settlements can include:

(1) Blockchains can help jumpstart the nascent E.T. economy—when the human population of an Extra-Terrestrial Body reaches a (pre-determined) critical number; an economic setup based in Blockchains can be initiated. This will allow for a completely cashless economy (which does not produce any waste) to function for the benefit of the Extra-Terrestrial Settlements.

(2) Value creation and value transfer can take place without any hitch between members of the Extra-Terrestrial Settlements and also between the Extra-Terrestrial Body and earth.

(3) The E.T. cryptocurrency can be traded on earth based exchanges. This will create a source of revenue and also a means of investments into the Extra-Terrestrial Body.

(4) Blockchains can be used for voting, contracting, legal functions, taxations, lending and borrowing activities etc. on the Extra-Terrestrial Body. This will eliminate the need for a large manned bureaucracy which will be unsustainable and costly on an Extra-Terrestrial Body.

(5) Most importantly, Blockchain technology will provide the basis for future IoT on the Extra-Terrestrial Body which is one of the steps in the evolution of a viable Artificial Intelligence ^[6]. In fact, the first fully independent A.I may be E.T in nature (i.e developed by humans on an Extra-Terrestrial Body)

(6) Since future systems will probably be based on Blockchains and IOT on earth, Blockchain technology and IoT on Extra-Terrestrial Bodies will provide a semblance of a bridge and uniformity between earth and the Extra-Terrestrial Settlements. This will act like an umbilical cord that will keep E.T colonies connected to earth and hence keep humanity whole.

Space exploration and colonization cannot be sustained indefinitely by Earth's limited resources; hence the need to make Extra-Terrestrial Settlements Socio-politically and economically viable.

The proposal is to therefore form an Extra-Terrestrial Blockchain Authority (ETBA) as an associate Body with IBSES ^[9].

ETBAs will:

- (1) Manage Blockchain related issues of Extra-Terrestrial Bodies and
- (2) Also conduct research into Extra-Terrestrial Blockchains and Earth based Blockchain interface.
- (3) ETBA will also manage the stock exchange trades of E.T cryptocurrencies.

Thus ETBA will provide support in matters relating to Blockchain technology and also monetize the proceeds coming about from such a venture.

- (4) ETBA will, by keeping a uniform Blockchain regime ensure the implementation of the 'law of return'

CONCLUSION

We have realised that there are many questions to be resolved regarding the socio-political issues that may arise with respect to future Extra-Terrestrial Settlements. The legal status of Extra-Terrestrial Settlements, as also their international standing, is to be decided by the Comity Of Nations (in the form of the United Nations or a similar appropriate organisation). It might be possible that if these issues are not resolved, there may be a socio-political breakaway of the Extra-Terrestrial Body from earth's humanity, once the Extra-Terrestrial Body becomes self-sufficient. This will essentially cause a 'break-up' of humanity into two or may be more fragments (one on Earth and the 'other' on Extra-Terrestrial Bodies). One of the untoward consequences will be that Earth's humanity may be deprived of exotic resources which can potentially open up new economic and social avenues.

It is therefore imperative to keep humanity as a united whole. To provide a sense of connect and uniformity we can use Blockchain technology (It will be accomplished by ETBA, an arm of IBSES). This will ensure that humans on Extra-Terrestrial Body function autonomously within the broad framework of Earth's socio-political and economic setup in Harmonious co-existence.

ABBREVIATIONS AND TERMINOLOGIES

E.T.: EXTRA-TERRESTRIAL

ETS: EXTRA-TERRESTRIAL SETTLEMENTS

ESVE: EUROPEAN SEA VOYAGES AND EXPLORATIONS

ETBA: EXTRA-TERRESTRIAL BLOCKCHAIN AUTHORITY

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