Yves Paumier

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The megalithic causeway

(French original version (June,6 2014)) : http://www.solidariteetprogres.org/documents-de-fond-7/economie/la-chaussee-megalithique-nouveau.html

Shall the coming generations of men have no option but to crowd in along a narrow band of earth along the world's seas and rivers ? Ineluctable as that might seem, our thesis is that a population-magnet could readily emerge in the very heartland of continents : new and beautiful cities, where pioneers will find a welcoming environment. Building cities has hitherto been a lengthy endeavour but a new proposal may change all that : the megalithic causeway.

Whether the city of tomorrow or some ancient city re-emerging from its slumbers, whether the prompt satisfaction of the enormous logistical requirements that water supply, agriculture, energy or transport call for - the megalithic causeway provides a simple way of bringing to the very site all manner of perfectly operational equipment. Hitherto available only to mining- and petroleum-extraction installations or to populations next the sea and great rivers, that privilege will soon lie before the landlocked ! And this new heavy-transport system will mean a fundamental shift in the balance of power on this earth.

Figure 1 : Er Grah menhir, Mobihan, France.

25m long and weighting 280 tonnes, it's the heaviest Western European megalith.

Figure 2 :

A chemical industrial reactor ready to move. It's several hundred tonnes on wheels. (Photo : fagioli.it)

As we have shall use the term here, megalithic causeway refers to a very broad road, over which giant transport units can travel, units ranging from hundreds to tens of thousands of tonnes.

Although, indeed one does occasionally see exceptionally-large convoys moving at a snail's pace along the motorway, these generally weigh 80 to 150 tonnes, and only very rarely 300. While the megalithic causeway will easily deal with the challenge of moving objects ten to one thousand times heavier !

As one might expect, the vehicle's humungous size will most certainly have children jumping out of their skins, but how it works will be perfectly plain to their parents.

At the time of writing, causeways of this nature are built for a very specific and often one-off purpose, for example, where a huge piece of mining equipment has to be moved. But in the future, such causeways will be a prime means for creating new metropoles and accelerating the development of heretofore landlocked areas. A new epoch for mankind lies before us.

A new era of growth

Throughout history to date, only those areas that one can reach either by sea or down a wide river have enjoyed real growth. Now, it is true that some cities like Timbuctoo, lost in the desert, have once been capitals or major trading and intellectual crossroads. History moves on however, and dust blows over such capitals *unless man intervene with great energy. Beijing has thus remained China's capital, owing to the thousand-year, on-going process of building the Great Canal.*

A contrario, newly-founded cities like Brasilia have not taken off. Would they though, had they a megalithic causeway ? We shall see. The 20th Century's greateset ocean ports [e] have become undersized, and some will even be abandoned, if deep-draught vessels cannot dock there. [1]

Insofar as transport is concerned, the trend has been to divide freight up into standardised basic elements like containers. Any notion that the megalithic causeway would make exceptional, indivisible convoys a matter of routine may seem to be swimming against the tide. But our scale is vast sweeps of continent : to build new cities, open new mines or build dams, the more separate elements there are, the greater the flexibility. That being said, for each type of activity, the decisive issue will be the ability to produce the most effective heavy object. Building in concrete means moving millions of bags and entire fleets of lorries, as well as having a quarry and thus a production factory at a reasonable distance. Provided it arrive prefabricated, such a factory would be profitable straightaway. The same applies to steel used in construction : with an already-assembled factory for welding and X-raying beams, the entire process will be far more productive. And the moment a processing factory is moved on site (refrigeration, packaging), a farm becomes an agro-industrial firm.

Under-developed Continents

Today, half - and by 2035 if current trends continue, three-quarters - of the world's population lives along a narrow 100 km coastal strip. Only too often, major infrastructure works have merely served to worsen the imbalance, notably by "improving" already-existing metropolis, of which the overwhelming majority lie at the water's edge. In Libya, the Great Manmade River pumps water in a desert thousands of kilometres away, to serve expanding coastal cities and for the surrounding market gardens. Why not build new cities where the water springs from the earth ? Morocco is building a high-speed railway - wonderful idea - but why should it merely sustain growth of already-wealthy coastal cities ? Examples abound, heavy with storm clouds.

To forge the bond of Union, a century and a half ago Abraham Lincoln ordered the building of a continental railway. Stretching from New York to California, it was far better suited to expanding domestic commerce than the old London/Boston sea route. The same is true of the Saint Lawrence Seaway, linking the Great Lakes in the heart of North America to the Atlantic. Or the ancient Silk Road : Samarkand and Baghdad emerged and became great - or declined - as one or another route became practicable. The colossal sums China and Russia have begun to invest to reopen those avenues, show that Asia has taken the lesson to heart.

As we go to press, the notion of "development corridors" or arcs of metropoles is squarely on the Asian agenda. From that day in 1996 when Helga Zepp LaRouche, the Schiller Institute's Chairman, launched the Eurasian Landbridge (EL) project at a conference in Beijing, the new Silk Roads have become part and parcel of China's development, and that of Russia, India ...

Concrete steps have been taken, general and specific agreements signed between two and more nations. Those countries' Transport Ministers have arranged for swift passage of container-trains from the China Sea to Poland, faster than the Suez sea route. Besides the EL plans, there moves to break a passage under the Bering Straits, and thus connect North America directly to Russia, China and Central Asia. Other development corridors have been proposed at the regional and national level, such as Transaqua and the New Nile in Africa.

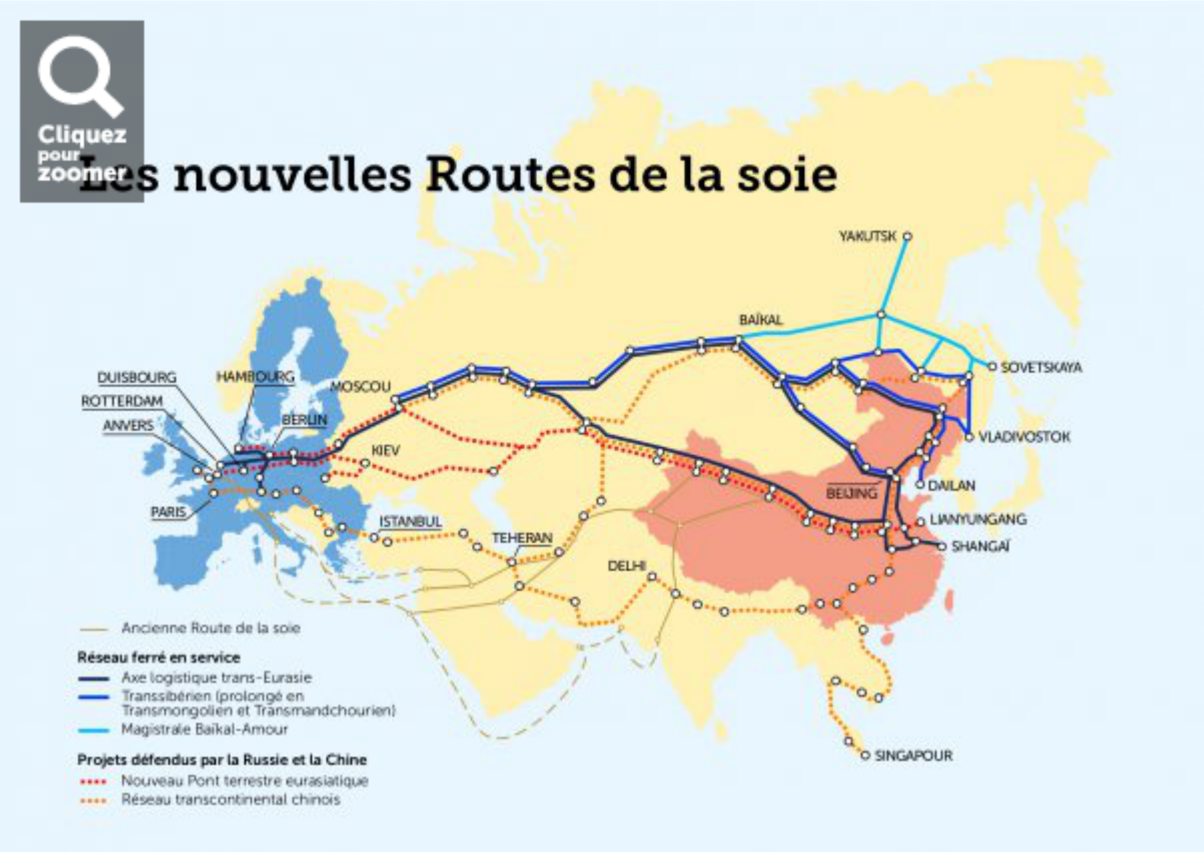

Figure 3 :

Map of the Silk Road, executed by Solidarité & Progrès, from Theo Deutinger and Kit Chow's "Iron Silk Road".

Here the curtain rises on a new notion : the megalithic causeway, which will vastly increase the potential these projects represent, and enable proper indicative planning and give one-third of mankind the chance to build a dignified life for itself.

Indivisible Transport into the Heart of Continents

Throughout history, it was by sea and along the rivers that very heavy, indivisible convoys would be moved. But what about infrastructure into the heart of continents that lack a dense fluvial network ? A new and artificial means of transport is wanted, presenting the advantages of peaceful rivers without topographical drawbacks : the megalithic causeway.

Their heartland being inaccessible to heavy convoys, Africa, Asia and Australia are the three main continents concerned.

Most often, a fluvial transport network's configuration is like a tree's root-system : as it moves inland, it peters out. This is where a megalithic causeway network would prove revolutionary, as it would connect several river basins wherever the distance between navigable networks is slight relative to those networks' size. A good example for South America (Cf. below) is the link between the Amazon and Paraguay Rivers.

At issue here is a notion one might also call "a dry canal", and one that pertains to aspects other than transport. Water supply will have to be dealt with separately. Another significant feature is that the actual vehicle used in transport is not a major concern, since the technology has long existed. That being said, the vehicles will be larger than anything currently seen.

In terms of progress-dynamics, a megalithic causeway is a signpost to history, a state-of-the-art piece of technology built for exceptional purposes in the face of insurmountable obstacles. It blazons forth the willpower of an age, like Charlemagne who twelve centuries ago intended to link the Rhine to the Danube and the Rhône to the Loire. In the truest and most historical sense, the technology is *not only great, but political.*

The technology will transform the future of whole areas, not only the very poorest, but those where growth has hit a plateau. It coheres with the ideas of the most forward-looking thinkers (LaRouche's EL, Nakajima [2]). Conventional supply and demand thinking cannot judge of its profitability, because the aim is to create entirely new wealth !

Did you say "primitive" ?

Although few would see it that way, even the ordinariest of roads is a highly-technical thing - an unbroken surface for wheeled vehicles rough enough for tyres to grip, slightly inclined to allow rainwater to run off, though not so much as to cause discomfort, sturdy enough to bear up under heavy lorries without buckling or showing up ruts. In a nutshell, it is an earthen berm forming an unbroken level surface, over which lie between five and nine layers, each having a specific technical purpose. Only the final, wear-layer, is visible however. While a technical surface will naturally prove costly, a basic megalithic causeway is a single-layer road, eventually with a berm. Building costs are generally low, equivalent to the temporary lanes for public works, although for complex projects they may of course rise.

The megalithic causeway is first and foremost a concept, nor need it be a permanent structure. On occasion, a stretch of longitudinal meadow without too many bumps will fill the bill and on other occasions, nothing but the water of a lake or stream. Whatever the surface, it must be broad, unbroken and bump-free, so as to bear the convoy and its thousand-tonne freight. Simple as it seem as first sight, the megalithic causeway is an advanced notion, as the ponderous convoy will rely on state of the art techniques.

Heavy Convoys before the written Word

The term heavy convoy does not, perhaps, reveal how quite extraordinary were the original megalithic causeways. For example, the 7th Century BC Greek causeway between the Gulf of Saronika and Gulf of Corinth. First in wood, then in stone slabs, thanks to the causeway ships were drawn over the obstacle. Or the pyramid-builders, who dug canals to bring up huge blocks of stone from the riverside, and traced lanes in the mud over which the blocks were slid.

At the other end of the planet, on Easter Island, our ancestors had designed a complete megalithic network over which they "walked" the famous statues dozens of kilometres from the Island's sole quarry to its far end. As for the Celts, they moved dolmens and titanic menhirs over specially-built roads. The stones that lie at the very tip of Machu Picchu were brought from quarries dozens of kilometres below. According to Roger Olivier's thesis Routes, mégalithes et peuplement (Roads, Megaliths and Human Settlements), many of the roads still used today were originally megalithic causeways. World over, there are countless sites with names like The Giant's Causeway, where massive stone blocks have clearly been shifted over astounding distances. But having forgotten how, we prefer to believe in an ancient Race of Giants !

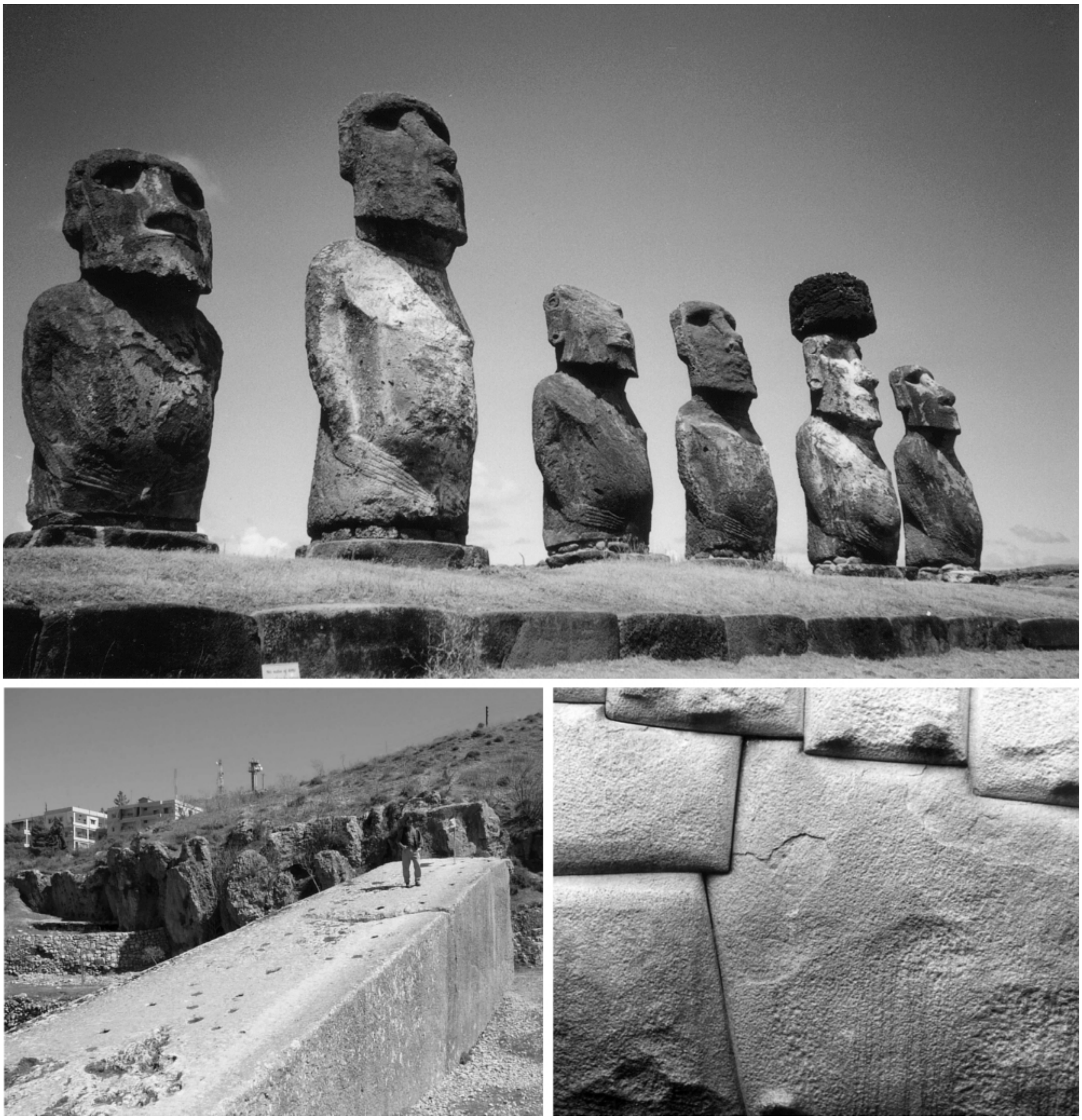

Figure 4 :

Top : Easter Island giant statues.
Bottom left : block of stone Balbeek, Lebanon.
Bottom right : stone wall, Machu Picchu, Peru.

Ponderous Convoys : Applications

Let us now turn to those areas where the new means of conveyance takes on full significance : mining, technological enterprises, technical obsolescence and end-of-life cycle for heavy equipment, building new cities and in the event of a natural disaster.

As in shipbuilding, where ship-parts are built simultaneously on several sites then assembled on a single site, or better still, on the actual end-use site, heavy indivisible objects are also conveyed overland - initially, bridge-decks to span rivers, then railways and motorways, and finally, exceptional convoys.

In a nutshell, international trade means gigantic ocean-going freighters groaning under the weight of up to four thousand containers. Bearing in mind that once a single container is loaded onto a train or lorry, transport costs go up by a multiple of ten ; must landlocked regions therefore remain so forever ?

Mines can be exploited in two ways : either open-pit, using enormous earth-moving equipment, notably for coal, in countries with access to the technology, or in those that lack it, by backbreaking *manual labour. In Guyana, the mine-operators enlarging a bauxite mine, built a roadway 12-km broad, to bring an excavator in from Bahrain.* [3] *Riding the tens of thousands of miles of waves from Bahrain was no problem - the real exploit was navigating the 12 km through the jungle.*

The other application has to do with technological change. Whenever a technology evolves, the production site concerned has to be restructured top-down. Often the earlier installations will simply be abandoned and the workers fired. Does wisdom not dictate bringing onto site preassembled, modern factory parts, to ensure a transition both to new technologies along with new, more advanced jobs ?

Figure 5 : Several examples of giant objects weighing each several thousand tonnes.

A ball mill and a mining excavator ; an old and a new bridge being towed away, a power transformer, a chemical factory and a desalination plant. (Photos : fagioli.it et scheuerle.de)

While the nuclear industry considers that decommissioning old reactors is part and parcel of its mission, the idea is no less pertinent to the chemical and many other industries. Evacuating heavy equipment along a megalithic causeway to specialist recycling sites, will afford both higher safety and higher environmental standards.

As for municipal household waste - including exceptional volumes of construction waste - some riverside towns already have it removed along the waterways. In building new cities or restructuring old ones, this can already be done on water ; megalithic causeways would be a plus.

Should a natural disaster strike, the indispensable governmental agencies (hospitals, fire-stations) or heavy equipment could be moved along the causeway within two or three months, and thus avoid looting and a population exodus.

A standardised megalithic causeway network

Merely being landlocked is an obstacle itself. We propose building a transnational, standardised megalithic network to energise entire countries.

The standards will be calculated in relation to how much freight the causeway can bear per square metre. Standardisation will ensure that causeways be compatible world over, for example, to move an indivisible object from a traditional canal like Panama to one designed for the heart of a continent.

The techniques used in building the machines that will travel along the megalithic causeways could not be simpler. Every country on the planet can break open a causeway with the most rudimentary of means, although more sophisticated ones do of course mean tighter building deadlines and greater freight capacity. The real issue is the standard, and compatibility. We suggest using as the main criterion, the capacity to bear a moving load, expressed in hundredweight per square metre, added to the initials MLC (Megalithic causeway).

Using this shorthand, the basic causeway will be MLC02 (200 kg/m^2 capacity, i.e. 2 cwt/m^2), the highest traffic-volume the MLC30 (3 t or 30 cwt/m^2) and most powerful the MLC65, the dry-land equivalent of the Panama canal (6.5 t or 65 cwt/m^2). These causeways' load capacity will depend on the foundation's quality, i.e. number of layers and degree of complexity. For an MLC02, an ordinary causeway (several layers of pebbles and gravel) will do, over which carrier trucks will travel at bicycle-speed.

The Panamax Standard

The Panama Canal has been so successful as to create a reference and standards, which we shall adopt for practical reasons. To assess what its megalithic causeway might be, let us look at the typical Panama-canal cargo.

The Panama Canal Authority defines the maximum size for ships passing through the canal ; their total mass will typically be 65 000 tonnes (ship's weight plus cargo). The Panama lock chambers are 33.53 m by 320 m, i.e. an area of 10,730 m^2, with a load capacity roughly equivalent to 6.5 tonnes per square metre. By comparison, a freight railway used for moving ore will normally bear 2.7 tonnes per m^2. This standard is the Panamax.

A dryland Canal to the Panamax Standard

Figure 6 :

The Panama Canal will soon open it's new seaway locks. Here are the doors on their way in. (Photo : ACP)

To avoid transhipment, the overland megalithic causeway over which the same size load can travel (ship plus cargo), could be built slightly larger to hold an extra carrier [4]*. The ship (32.3 m x 294.1 m) placed on a slightly-larger carrier (50 x 310 m), i.e. motorway+ shoulder width, by adding the carrier's weight (say 4,700 tonnes or 7 % of the load), load capacity represents 4.5 tonnes per square metre* [5]*. A dryland MLC45 would be a worthwhile alternative, thanks to a slightly-larger load-surface, relative to a waterborne MLC65.*

Choosing a load-carrying Vehicle

To date, platform trailers have been the method of choice. These are electronically-guided motorised platforms on tyres (figure 7), designed for roadways or quays. But for the megalithic causeway,

Figure 7 : Typical platform trailers.

(Photo : fagioli.it)

Figure 8 :

NASA rockets are reaching their launch pad on this specialized very heavy platform, called the Crawler-transporter. (Photo NASA)

adapted to the very convoy which will be using it, the designer will have more latitude, useful for the order of magnitude of the mass at issue : thousands, rather than the current hundreds, of tonnes. The designer can call on tyres, caterpillar tyres, moveable pads or studs, the slippery mud-lane of ancient times, rail, or one or more of these combined.

In modern times, the first imitation of a megalithic causeway with vehicle, was the shuttle crawler-transporter, built in 1965 to move the Apollo programme rockets, figure 8). However, its gigantism (8,500 tonnes mounted on eight de 40 m x 35 m caterpillar tyres) make it too specialised, ponderous and slow for general application. The same is true for the French engine at the Kourou space station, where the mobile launch platform moves over a double railway (640 t).

Today, heavy convoys will generally be loaded onto a wheeled vehicle : multi-wheeled platforms move chemical tanks or airplane wings. Designed to travel along conventional roadways or harbour-roads, such platforms can bear loads from one to three hundred tonnes,.

“Lighter” cargos should in fact be moved along an air-cushion, a simple, flexible technique suited to wide lanes, long distances, varied road surfaces and low speeds. We shall then look at a technique that combines the wheel and the air-cushion for middling capacity, and then the wheel and caterpillar tyres for cargos of greater mass.

Air-cushion : 2 000 t capacity

Air-cushion technology (figure 9) is best suited to indivisible objects, with a mass well below Panamax. Air-cushion load capacity is roughly 100 kg/m². That works out at 1 000 tonnes on a Panamax reference area of 10,700 square metres.

Figure 9 :

A simple air cushion vehicle is enough to move heavy industrial equipments. (Photo : smeyers-tu.be)

An MLC01, the simplest with this technology, allows for one-thousand tonne capacity. Implementing a simple improvement, with a double internal cushion over the central area and with pressure increased to 220 kg/m², will double payload capacity. The extra thousand tonnes is easy to reach. A basic MLC02 megalithic causeway network designed for air-cushion technology can bear 2 000 t loads. Were the causeway made smoother by adding a more complex layer, pressure could be raised to MLC03 level, and 3 000 t moved.

terraplane : capacity 5 000 t

A wheeled structure can be loaded with 3 tonnes per m² ; a causeway able to bear such a structure would be equivalent to an MLC30. Enter the terraplane [6], a combined air-cushion/wheeled lorry suggested by the French engineer Bertin (figure 10).

Figure 10 :

Jean Bertin's Terraplane is an air cushion and wheel all-terrain truck. (Photo : unusuallocomotion.com)

By placing wheels over 1 000 m^2 round an air-cushion technology carrier of 10 000 m^2, an extra 3 000 t can be moved, working out at 5 ,000 tonnes overall ! Although far from the 65 000 t of Panamax, the great advantage to an MLC30 is that it can handle 1 % slopes, which will vastly simplify road layout relative to a canal or freight railway. What is more, an air-cushion cum terraplane technology is amphibious : the freight can be "walked" across water and causeways designed for dryland, waterborne or marshy segments.

Wheel, caterpillar tyres and rail : capacity of up to 72 000 t

Each technology can be adapted to megalithic transport beyond the Panamax standard, which corresponds to the works now underway to enlarge the Panama canal. Although such dryland causeways call for thicker, harder and thus costlier surfaces, they will bear the very biggest ships passing through the Panama Canal and bring them over uneven terrain.

Dual-use technology

Figure 11

The MLC can also be used as a pathway for ground-effect vehicles like the Ekranoplane or WIG. Initially, these were seaplanes barely skimming the water's surface. Their wings are shorter than an airplane's, given a payload capacity triple that of a plane per square metre of wing. Midway between a slower airplane and a swift shape (ideal cruising speed : 180 km/h), such machines can skim over hard surfaces like an MLC as well as water. In Asia, where they used by the coast guard and as taxi and freight-palet carriers. WIGs are - so to speak - taking off !

II. Proposals for the megalithic Causeway

From one continent to another, now for some examples of how the megalithic causeway could be used.

The megalithic Causeway at Fayoum

The most obvious case is the dryland canal at Fayoum. Egypt is a desert, through which the runs the Nile Valley like a ribbon, on which 95% of its population resides, if one include the delta. Population density is 1,500/km^2, and at Cairo itself, 40 000 habitants/km^2.

The country's greatest wealth since prehistoric times, the Nile is now cut off from the Ocean, bridges having been built the length of Cairo that bar the river there to ocean-going vessels. And although Nile agriculture is strategic to Egypt's survival, its banks have been quite cemented over.

Figure 12 :

With the Fayum CML, the whole Nile river will become an extension of the Indian Ocean, and the Sahara Desert (on the left) will be open to development.

To get round the problem, two major development corridors have been proposed, one extremely urgent : that proposed by Farouk El Baz. Assuan Dam water would be diverted, and about a hundred km West of the Nile, a new development pole built with an aqueduct, railways, power networks and a string of new towns. A second approach is the brainchild of Engineer Aiman Rshdee : water from the Oubangui river basin in the upstream Equatorial area will be diverted through Sudan to carve out, much farther West than the Farouk El Baz plans, a similar corridor with a navigable canal ; the water will finally spill into the Qattara depression, connected to the nearby Mediterranean Sea by locks.

At the end of the day, and whatever the approach selected, heavy equipment will be needed on site both for building infrastructure and the new cities, as well as for agro-industrial and mining purposes ; there will be heavy traffic for special convoys.

Food crops to support population growth is critical to Egypt's future. She will need new, ultra-modern agro-industrial units, although at present, she can boast neither the skilled manpower, nor the infrastructure.

There are two options - either bring in tools and materials from abroad to build the factories, or else have everything partially pre-fabricated and then assembled on site by workers less skilled than expatriates. The second - involving the MLC - would be a stronger response to pressing need, and would allow for swifter and smoother development.

Starting upstream of Cairo, the Fayoum dryland canal would spill into the Red Sea and thus be a new portal to Asia, which has already tended to become a hub for Africa's trade. Its first task will be to connect the Nile to the Red Sea, the second to make the Nile the starting point for other megalithic causeways that will run through the Sahara towards the afore-mentioned big projects, mining and agricultural areas, and then still further off into countries like Chad.

As the purpose behind this link is to break open similar ones upstream of the Nile and into the heart of the desert, the causeway should be built for regular use. 213 km long, its maximum altitude will be a moderate 267 m, at a fairly slight incline, leaving room for further improvement.

The anticipated causeway size is MLC30, able to bear terraplanes, those giant lorries on wheels and air-cushions, that can carry 5 000 tonnes loads at speeds of circa 30 to 40 km/h. [7] *The loads could* *be factory parts from Asia or elsewhere. Once at the Nile, the parcels could be placed onto barges to travel hundreds of km upstream. For lighter loads, i.e. under 2,000 tonnes, the load-carrying vehicle (terraplane or air-cushion technology) could cross straight over the Nile and connect with lesser-capacity causeways of the MLC02 type, to move across the Sahara towards new cities located along the two corridors now in the planning stage.*

To the Egyptian population, a young and dynamic one, the MLC will be a wonderful means of access to these new regions emerging from the desert, that lie outwith the Nile Valley.

The Congo megalithic Causeway

When Congo River explorers finally reached the continent's heart, they realised that for the landlocked segment of that great river - the world's second largest - access to the sea would utterly transform the area. Indeed, this endless pathway through the interior, navigable over more than 6,000 km, the Congo River has no access to the sea owing to hundreds of kms of impassable rapids that begin at its very mouth. One university study suggests building a canal with locks to get round the obstacle.

In the interval to such a technological exploit, a megalithic causeway would fill the bill. It could be built very quickly and connect the African continental plateau to a vast sea port. A causeway is all the more pertinent, that Congo barges have little capacity owing to the river's slight draught - often less than 2 metres. Although, to increase its potential, the Congo's channel will have to be rectified, the depth will be in that order of magnitude - far less than for ocean-going ships.

Currently, the capacity of Congo barges lies below 1200 t, while pushed convoys can reach 4,000 tonnes. As an indication, we shall set the norm here at 1800 tonnes for barges measuring 135 m x 17 m with a 2.4 m draught. The corresponding MLC would be a MLC08.

Figure 13 :

The Congo CML's will link the sea harbour of Matadi, situated in the river's estuary, up to Kinshasa and Brazzaville. The CML will steer around the obstacles along the 220 km long Livingstone Falls. By doing so, the gigantic navigable water system extending beyond the RDC and Congo capitals will be opened up, and the consequences for the commerce will be incommensurable.

As the itinerary is far more uneven than is the case for Fayoum, the causeway should be able to bear caterpillar-tyred vehicles, a double railway like the carriers at Kourou, or even water-cushion vehicles since this is a tropical zone. Its length (roughly 200 km) and layout would essentially be as per the KINOC study by Robert Arnould and Bertin Bagula Chibanvunya. [8]

A guided water-cushion pathway would afford a readier transition for barges between the causeway and the Congo upstream and downstream. A water-cushion resembles an air-cushion except that it is fed by water that can, for example, pumped from a stream ; the advantage is that it can bear charges one to two orders of magnitude larger than the air-cushion.

1800 t being commonplace in River-Sea shipping, ships purpose-built for such barges [9] *would provide direct service from the heart of one continent to another. Sea ports would no longer enjoy pre-eminence over navigable rivers, and a string of new cities could be built all along the Congo River.*

In future, two other rapids will need to be shot, well upstream and over shorter distances. The Katanga and its mines will gain access to the sea as will other landlocked parts of Africa. Equatorial Africa will be opened up and the Democratic Republic of Congo will be able to better distribute its population density by making development corridors of its rivers !

The Okavango River causeway in Namibia

A development corridor stretching from the Namibian Atlantic coast and crossing the desert coastline will open the landlocked interior. An MLC02 to move 2,000-tonne indivisible loads on air-cushion technology could be built at little expense. From a starting point on the Atlantic near Wlotzkasbaken in Namibia, the causeway will reach the African plateau at circa 1,500 m altitude. At a fairly smooth incline (0.6 % slope), the causeway will extend to Okakarara, then connect Zimbabwe and Zambia. To the North, it will bypass the magnificent inland Okavango River Delta, a surface trace of a vast endorheic (closed) basin. A connection with Lake Kariba can be readily made, along with access to the heartland of Southern Africa.

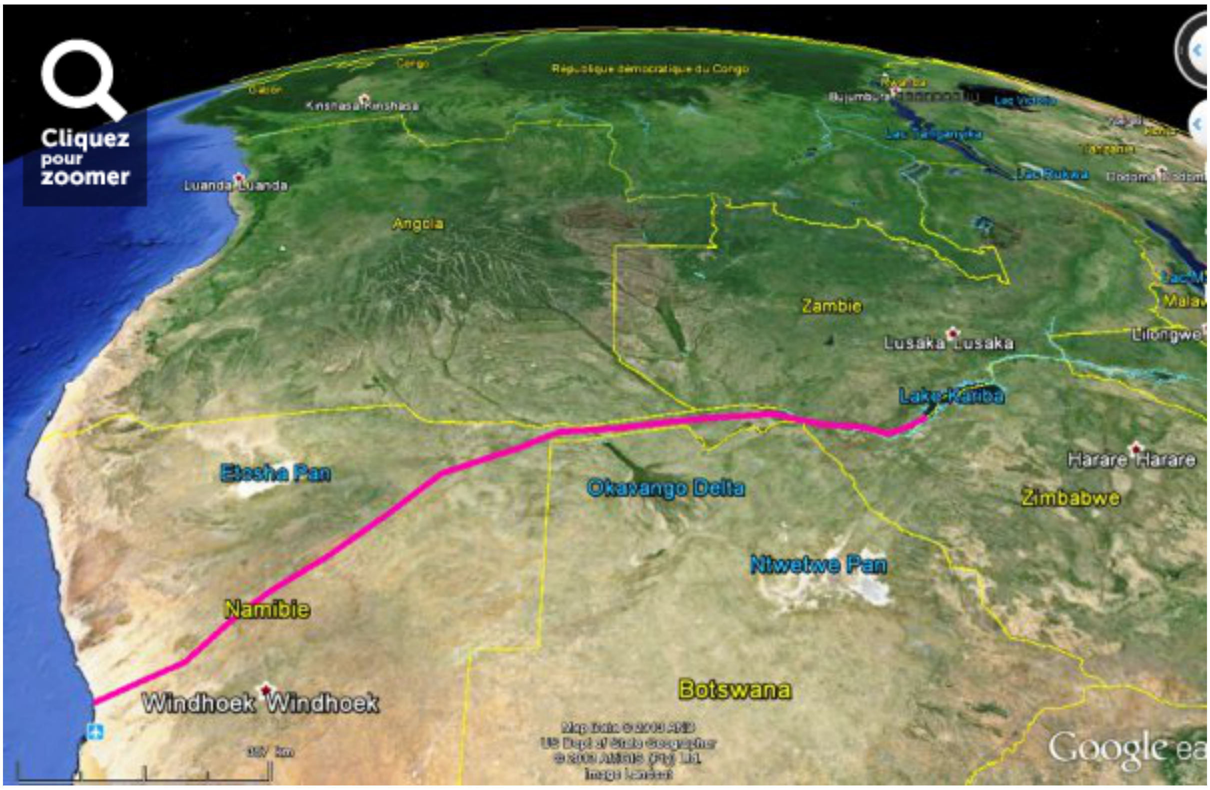

Figure 14 :

The 1500 km long Namibian CML has a hidden function beside heavy transportation : reducing ecological risks and casualties for the fragile Okavango endoreic water system. By turning around the interior delta and allowing heavy loads to be brought in the heart of the continent, where they are needed, a durable base for a future is established in the heart of Southern Africa.

Affected by a high rate of infant mortality, this vast area is underpopulated as well as underdeveloped, being so hard of access. Although the presence of strategic metals and minerals would make its geological potential extremely attractive in the short term, no mapping has even been done !

Now, were an extraordinary geological find to be made, the immediate danger would be reverting to the old colonial model, as one sees at Zouerate in Mauritania, with its mine, mining camp, railway and port - and no regional growth whatsoever.

On the contrary, a megalithic causeway would revitalise growth, by crossing the entire country up to the first lake of the Great African Rift. Unlike the usual freight-railways used to move ore, large indivisible loads would move over the causeway on 50 m x 20 m air-cushions ; new pre-fabricated cities could be installed. A city calls for police and civil servants, schools, hospitals, laboratories, water-treatment plants, cement factories, electrical power stations and so forth.

Were one to attempt to install each of the above technologies with its own site and base camp, and bring in the skilled workers and equipment (mining equipment, all manner of machines and complex building-equipment cum-parts), things will tend to stagnate at the covered-waggon stage. But could the builders have access, on site, to all the basics one would generally find only in a large city, the pre-conditions for a real urban culture taking off - although proper to the particular geographical area - will exist.

Great attention will have to be paid to the environment, owing to the Okavango River Delta being endorheic : since pollutants that might affect the underground water tables cannot be evacuated towards the sea, everything will have to be recycled and properly processed.

Agreements will have to be struck with Zaire and Angola to bring in water for agriculture and city-building.

The 1,500 km causeway's basic configuration will be MLC02, the simplest, coupled with air-cushion vehicles, which will allow the local population to be readily integrated. As time goes on, simply by adding on more layers and different surfaces to the causeway, a larger payload will be obtained.

For this area between the Tropic of Capricorn and the Equator, the outcome will be far higher population density, and a far better quality of life, as Africa puts her imagination to work to build a new Athens, a new Thebes.

The Kra Canal (Thai Canal)

Rife with all manner of hazards, the Malacca straits swarm with sea traffic ; as for Malay Peninsula geography, it poses a major problem for trade.

Figure 15 :

Optimally located between India westward ; China, Korea and Japan eastward ; Australia and Indonesia

southward, the Kra Canal lies in a strategic position. The Malacca Strait is saturated. 80 000 boats and a quarter of the world commerce are passing through it. A CML and a canal will clear the strait congestion. Moreover, the Kra CML will offer a unique link to speedy ground effect boats called Wig.

Thailand has put forward an alternative to by-passing the peninsula, which would involve building a thousand-km long canal through the Kra Isthmus for ocean-going ships. For centuries now, several different sites for the canal have been mooted.

Preliminary studies have long existed, which show that to be profitable, a maritime canal would have to be at sea level, i.e. without locks. Titanic as the excavating works will no doubt prove, China has proposed to do this within a single decade. To avoid having to pay the Kra Canal toll, which for a wide canal, will be extremely high, shipping companies operating really big ships would doubtless take on a 1,000 km detour and the extra day and a half's sailing. Indeed, at crusing speed fuel consumption is very low, compared to the cost of braking and manœuvring in the Canal and then getting up to speed. A major factor will be energy prices anticipated at the point the canal goes on line, along with security issues and the traffic bottleneck at Malacca.

A dryland canal with regional impact

Although the megalithic causeway will follow one of the proposed layouts, it will be a dryland canal, with a twofold purpose : allow smaller-draught ships, which have much to fear from local tides and storms, to cross the Isthmus along with ground-effect aircraft (WIG). The latter have come into increasing use in these areas, teeming with islands. A megalithic causeway would immediately play a role as a growth-vector in economies that have tended to be almost exclusively coastal, such as Indonesia, Viet Nam, Thailand, India and even Korea.

With an MLC20 as the ultimate aim, one would start with an MLC02 and smaller-draught ships, then upgrade the causeway for larger-draught ships. Should need arise, the causeway can be upgraded to Post-Panamax capacity. An MLC02 or MLC20 could be built within three to six years, with wheel-, caterpillar tyre or double rail technology. Crossing the isthmus would take half a day.

Colombia : an Inter-oceanic Megalithic Causeway

The Isthmus of Panama is a most singular geographic feature, and the Canal a truly heroic achievement. Traffic through the Canal has now, however, reached its limits, nor does the Canal meet the requirements for integrating the entire Ibero-American continent. A new way must be found.

The purpose to building a megalithic causeway over the isthmus to Colombia would be less to service international container trade, than to connect, by sea, the river basins of the continent's Southern regions. Barge-carrier ships will ply the coasts of Peru and Brazil on either side of the dryland canal.

Of the MLC03 type, suited to barges of up to 3,000 t, and relying on the simple air-cushion technology, this inter-oceanic causeway will connect the lakes and rivers along its path. Again, it would be dual-use, including ground-effect aircraft (WIG) in a whole new branch of trade.

Figure 16 :

The megalithic causeways will foster continental integration with inland waterways from the Pacific Ocean to Buenos Aires. It's the "la futura gran ruta commercial de Sud América."

From the Amazon to the Orinocco

Since Alexander von Humboldt's bold expedition in 1800, during which he described the Casiquiare Canal, a natural connection between the Orinocco and the Amazon, countless scholars have observed that Ibero-America could be integrated thanks to its great rivers.

Here, we have taken the original ORIAMPLA expedition (1980) idea, presented by Gabriel del Mazo as a Draft Resolution to the Argentinian Parliament in September 2006 ; we have "twisted it" into an MLC03, designed for 3,000 t barges. The dryland canal could be open for business in a few short years, unlike a conventional canal. Taken together with the inter-oceanic Colombian causeway and *the dryland canal we are about to propose, this particular causeway would reach right into the heartland, and lead to major demographic and economic shifts. That happens to be the approach adopted in founding Brazil's new inland capital Brasilia in 1960.*

326 km long, the natural, pre-existing Orinocco Canal connects, at high-water seasons, two river basins - an extraordinary phenomenon discovered by Humboldt. Outwith high-water seasons, the waters are shallow, which makes for unpredictable navigability. Barge service on the megalithic causeway will of course be unaffected by high- or low-water seasons.

Jules Vernes'Le Superbe Orénoque, contains descriptions typical of explorers of the day. His contemporaries were seeking an El Dorado, gold and diamonds - indeed, there may be precious metals and minerals here. But prospecting has never been done. Again, with so many rivers, fish-farming would in theory be possible, though not without the refrigeration and distribution technologies not as yet available. The same can be said of tropical agriculture, so unsuited to chemical fertilizer as to call for advanced biological know-how, as well as familiarity with the terrain. Whatever the case, moving complex heavy equipment into the rain forest will be easy with the megalithic causeway.

A canal from the Amazon to the Paraguay River

At issue here is the junction, over hundreds of kilometres, between two huge river networks, the Amazon and Paraguay Rivers, located further South and spilling into the Rio de la Plata estuary. To open up Paraguay and Bolivia, where both the population, and the economy, are growing rapidly, a megalithic causeway has become a matter of urgency.

No consideration has been given to a conventional deep-water canal, owing to how long it would take to build, to the very substantial cost and to environmental problems.

Since the slope of the ridge line between the Amazon and Paraguay River basins rises only moderately, several paths could be traced. [10] We suggest a 370 km stretch with a slight slope (0.2 % on the Amazon side and 0.3 % on the Paraguay side). Only one-third of the causeway would actually have to be built up (further studies will demonstrate this), while the remainder could be either flat, marked-off surfaces or flowing water, that would need monitoring at high-and low-water seasons. The upper Paraguay River in the Brazilian Mato Grosso gives access to Barra dos Bugres, a city at its navigable section's far end. Flowing on, the river briefly marks the border with Bolivia, before crossing Paraguay via the capital Asunción ; for a stretch, it marks the Argentine border, and then spills into the Rio Paraná, itself a major navigable network over 2200 km long (Cf. map).

Once the MLC03 have been built, nearby and abundant energy resources such as a great dam, gas reserves and great geological potential should speed the founding of new cities and open up these promising countries.

Gabriel del Mazo's parliamentary resolution refers to two great North-South routes, one 7,000 km long, the other 8,500 km long. Who would care to object to such infrastructure, just because a few hundred km of road will need to be laid out ? Certainly not the landlocked states of Paraguay and Bolivia. In the words of the Uruguayan scholar Luis Cincinato Bollo : « la futura gran ruta comercial de Sud América ».

A Causeway to Heaven !

Chili already has an MLC, built of earth, and designed to move dozens of radio-astronomy antennae up to the roof of the world. At the Atacama Observatory, located 5,000 m above sea level, even the motors have a hard time breathing. A special machine [11] has been designed to crawl up the 10 % slopes, weighing as much as the antenna itself. This points to other possibilities in the Andes.

Figure 17 :

Lost in the desert, a caravan brings one of the the gigantic antennas to the top of Andean summits, home of the European Southern Observatory (ESO).

Megalithic Arteries in the Heart of Eurasia

In Soviet times, huge canal projects, some really very odd, were concocted for Central Asia. All, including, unfortunately, a number of indispensable ones, were dropped after the USSR broke apart. Geography remains however, as does the pressing need for heavy transport throughout the area, as the Russian economy turns increasingly eastwards.

Railways, key to the Eurasian Landbridge, will not suffice to equip so vast an area. Dryland canals are another story :

Turkmenistan, Uzbekistan and Kazakhstan, hard hit by the disappearance of the Aral Sea, Azerbaïdjan, Iran - all must gain access to the Black Sea and to the Mediterranean, while Siberia needs to be connected to those seas and to the river network West of the Urals.

The Karakum megalithic causeway

All too notorious is the ecological disaster become of the Aral Sea, once a stage along the ancient Silk Road. The Amu Daria, one of its two tributary rivers, must recover its flow, that was dried out by the Karakum canal used for irrigating intensive cotton production. 1,375 km long, the canal must become a mere aqueduct to supply water to Turkmenistan's capital Ashgabat while cotton monoculture must cease.

There will be nothing difficult about converting that barely-navigable canal into an underground aqueduct running beneath an MLC (Cf. figure 18). Unlike the existing canal, the MLC's starting point will be the Caspian Sea ; it will serve the capital and make the junction with other similar pathways to the Aral Sea towards the North, and Uzbekistan towards the East. The fact that the canal will no longer resemble a river, will be made up for by the fact that the new network will be broader, and open for traffic year round.

Figure 18 : Turkmenistan CML

Eastward from the Caspian Sea, the Karakum CML, in dark yellow, will connect the sea to Ashagabat, Turkmenistan's capital. An ecological purpose is also intended : replacing the Karakum Canal, which takes too mush of Amu Darya River water for intensive cotton production. The Aral Sea is thus becoming a salty lake. The CML will provide a better navigation service and save the Sea at the same time.
Westward, the orange link between the Caspian Sea and the Black Sea, leading to the Mediterranean Sea. Two options are represented by two lines, one of which shall be maintained.

The two-seas megalithic causeway

The Russian Federation and the Republic of Kazakhstan have put forward two separate proposals to connect the inland Caspian Sea and its bordering states, to the Black Sea and thus to international trade. Known as Volga-Don 2, the Russian proposal would call for less work, while bringing the existing "Lenin" canal up to a 5,000 t gauge. The Kazah proposal, known as Europa, would be 360 km long, with fewer locks, but entirely new and navigable by heavier barges (10,000 as compared to 5,000 t).

A MLC03 causeway roughly tallying with the Kazakh layout, would provide year-round service, while the canals are frozen 7 to 10 months a year.

The fact that there would be no locks along the causeway makes dual use (air-cushion technology, plus ground-effect aircraft (WIG) feasible, most attractive to the riparian states, and a legitimate source of pride for Russia, since the WIG were first built on the Caspian.

The Ural megalithic Causeway

European Russia has a widespread river network, the "five-river system", "five-sea system", which connects the Baltic, the White Sea, the Caspian, the Azov Sea and the Black Sea. The next challenge will be to create a similar network in Central Asia and the Siberian plains.

The megalithic causeway will pass just behind the Ural mountain range, crossing the demarcation line between the Ural River basins (Caspian Sea) and the Ob (Arctic Ocean), via the Tobol, its affluent. Without any need for enormous earthworks, a terraplane on an MLC03 will open up much of these regions. To ensure unbroken service between the Volga and the Ob, down which move 5,000 t barges, the causeway will have to become an MLC12 : terraplanes will have to devour great distances, which means getting up higher speeds ergo better road surfaces.

The causeway will become the main access-road to the great Siberian plains, and will be used for new mining and agriculture projects that call for specialised heavy equipment. Owing to the huge temperature swings, in these regions such equipment must frequently be replaced.

Figure 19 : a network of CML in the heart of Asia

The strategic CML is the one between the Black and Caspian Seas already discussed ; the other CML users around the closed sea will specially appreciate :
In pink, the Ural CML reaches up to the Siberian plains, allowing its economic development, something which the frozen rivers going the the Arctic ocean, like the Ob River, do not allow.
In yellow, the 2800 km long trans-Kazakh CML extends across the desert flatlands and reaches the foothills before Mongolia. This country must transform its oil revenues into equipments. The CML is an expedient and thorough response to this historical moment.
In yellow again, the Karakum to Turkmenistan CML, reaches its capital. Its importance is key for the renaissance of the Aral Sea ; and even more for its extension toward the centre of the continent, like Uzbekistan, and its fertile Fergana Valley. One other CML branche reaches the prosperous city of Bishkek. A connecting CML goes northward from this important place on the Silk Road to the Kazakh CML. Such an extensive interconnection is an intrinsic advantage to Asiatic CMLs, contrary to river networks.
Finally, southward of the Caspian Sea, the magenta CML finds its way through the mountain barrier in the north of Iran, to the Indian Ocean.

Turkmenistan and Kazakhstan will develop their own MLC networks, alongside the Commonwealth of Independent States (CIS), their Caucasian neighbours and of course Iran, to create a booming economy the whole length of the old Silk Road.

A European Illustration : the Lorraine Canal

Even in countries with infrastructure, the megalithic causeway has its uses. France needs to bring its river network up to the European gauge (Vb for 3,200 t ships), the Seine-Nord canal being the priority. This has been put off countless times for alleged money reasons. And what of the second canal, designed to connect Southern France to Northern Europe ?

So high is the cost of expropriating land, that the project might never happen. Whereas a dryland canal between the Rhine and Rhone, of value for all of Europe, will make up for these delays.

The Lorraine megalithic causeway connecting the Moselle to the Saone over 220 km, will have a gauge identical to the Seine-Nord canal (3,200 t) ; non-propelled barges and barges can be moved by air-cushion technology or wheeled carriers or a combination of both, the terraplane. At most, it will be no wider than a motorway, half the Seine-Nord canal. The technology is simpler and its cost, correlated to that of purchasing the land, much lower than that of a canal with locks. Mass- and speed-criteria favour an MLC28 type causeway. This could extend towards the Seine, but would have to be done quickly before suburban sprawl takes over.

A megalithic Causeway and ITER

Exemplary international collaboration is focussed upon thermonuclear fusion, the energy source of the future. France has been chosen, with a site near Cadarache, owing to the country's long experience. A purpose-built road was traced, to make up for the other proposed sites' advantageous seaside location, where indivisible 600 t loads can be disembarked. On April 8th 2014, success was achieved with a test convoy, that was moved by sea up the Caronte canal along the aforesaid special road, a megalithic causeway without the name !

Conclusion

This new opportunity to build pathways and specialised networks to move indivisible and very heavy objects will open up the continental heartland to economic growth, and foster a better demographic balance - a wonderful illustration of relative potential population density, as proposed by the US economist Lyndon LaRouche.

Being a dryland canal, the megalithic causeway will allow continents to enjoy growth in areas without navigable waters. Its power recalls the USA with the Mississippi River and Great Lakes, for heavy convoys and great mass. Thanks to the exceptional transport opportunities afforded China by her Yellow and Blue Rivers and the Great Canal, she became a major civilisation. Other cultures have left fascinating traces of objects and megalithic causeways. Tomorrow's civilisations will flourish to the beat of the megalithic causeway's still, smooth progress into the heart of continents.

[1] *Tanger Med, an entirely-artificial port built in 2010 in deep waters, was just a mountainous outcrop. The fact that forty objects weighing 6 000 tonnes each (compare that with the 7,300 tonnes of the Eiffel Tower) could be moved there to build up a dike, and then a thousand tonnes of container-cranes from Asia, allowed Tanger Med to be built ex nihilo. Marseilles, Genova, Barcelona and even Eastern Mediterranean ports will shortly be obsolete.*

[2] *In 1981, Masaki Nakajima, a Japanese engineer, drew up fifty major projects worldwide.*

[3] *Cf. : youtube.com/watch ?v=dxhISrEI1N8.*

[4] *The assumption here, is that the ship can be moved standing hull-up on its bottom, which will normally be feasible.*

[5] *(65 000 t + 4700 t)/(5 m x 310 m).*

[6] *Cf. : http://aernav.free.fr/Naviplane/M_Naviplane.html.*

[7] *A causeway with that capacity could move far heavier loads with a suitable vehicle though at lesser speeds.*

[8] *Cf. : www.kinoc.net.*

[9] *Cf. : cabinet-lebefaude.com/actu/13-cargo-porte-barges-fluvio-maritime.*

[10] *Like those presented by Gabriel del Mazo in 2006, as above.*

[11] *Cf. video (clik here.)*