COP21 –
Mekong Dolphin Extinction, Hydropower & Climate Change

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Abstract

Q: What do Dolphins, Hydropower Dams and Climate Change have in common?

A: They are all happening in the same location: the **MEKONG RIVER** – one of the most important rivers in the world. Often referred to as *The Amazon of Asia*, the mighty Mekong is the most productive inland fisheries ecosystem in the world and second in biodiversity richness to the Amazon.

Scientists for the Mekong offer this article to inform the public, the delegates at COP21, and decision makers worldwide about the Impacts of Hydropower Development **on the Lower Mekong River**. Particularly, their serious repercussions: Risk to the Food Security of 60 million people in SE Asia, the massive Ecological and Economic Losses, and their vast contribution of Carbon and Methane Emissions to Climate Warming.

This article provides an **Overview** of the many significant **Environmental and Social impacts of Hydropower Dams** on the Mekong River basin. To mention a few:

- Blockage of vital fish migration routes
- Loss of fisheries estimated at 560,000 tons per year for Cambodia and Vietnam
- Risk to Food Security of 60 million people in SE Asia
- Loss of Biodiversity
- Blockage of vital rich nutrient soils (alluvium) for agriculture and to sustain the Mekong Delta
- Massive damage to the Mekong Delta (home to 20 million, half of whom may end in Refugee camps)
- Economic losses of over $1 billion per annum for Vietnam, including Rice, fruit & vegetable export crops
- The impacts of Hydropower Dams on Communities' displaced by dams: psychological distress, loss of known food supply, relocation to unknown lands, loss of property, loss of livelihood, loss of cultural sites
- Substandard compensation to communities for losses.
- The extinction of the Irrawaddy dolphins, the rare Giant Catfish and hundreds of other aquatic species; among others.

We address "very sensitive issues", which local people in the region cannot afford to discuss *for fear of antagonizing governments, fear of loosing their jobs, fear of ending in jail or even fear of being killed.* As for foreigners most don't openly discuss these issues because *"we have to continue living and working here"*:

1. The Human Rights Violations associated with Hydropower Dams
2. Who are the real Beneficiaries of Dams (Banks & Corporations are named), and
3. The impacts of Hydropower Dams on Climate Change.

The *impacts by Hydropower Dams on Climate Change* are a grave concern and deserve a mention in this summary. Particularly, because Hydropower Dams are being promoted at COP21 as: *A Clean and Green Source of Energy; A Sustainable Development* ;*A Tool for Reduction of Poverty*. This could not be further from the truth. Well on the contrary, ***hydropower is one of the biggest sources of air pollution, accounting for 23% of the worlds' emissions of CO2 and Methane gases.***

In effect, **Hydropower *intensifies* Climate Change.**

Hydropower interest groups (Big Banks, Developers, Corporations), joined by poor countries such as Laos, will be at COP21 meetings in Paris. They will be lobbying to d*evelop a Global Carbon Market in which rich countries are allowed to offset their emissions against Clean Energy*, *i.e. against Hydropower's supposedly 'Clean energy*'... (This means more business for Hydropower interest groups.)

If such a decision was made on behalf of Hydropower dams, *it would* ***justify a Chinese-led frenzy of Hydropower Dams*** construction around the world, *with disastrous consequences for Climate Change and Water Resources worldwide.*

A Global Carbon Market endorsement of Hydropower will also give *Carte Blanche* to Brazil, Peru, Ecuador, Venezuela, Colombia, Bolivia, Surinam and the Guianas to **build hundreds of dams in the Amazon** basin, with the ***ensuing massive deforestation*** necessary to build the Dams' reservoirs. It would also encourage Laos to build another 70 dams, and other nations to build thousands of others.

The resulting impact on Water Ecosystems, Forests and Climate Change worldwide would be staggering and irreversible!

As it is, the planet's rivers are already suffering enormously from over 40,000 dams already built, from water pollution and climate change.

Any more dams will tip the balance against our most precious resources: WATER & AIR!

Moreover, any dams built on a large scale will also ***entail the displacement of hundreds of millions of people worldwide***, *creating a disastrous unnecessary humanitarian crisis*. To date nearly 100 million people have already been displaced for the construction of Dams, mostly in China and India.

Building new hydropower dams is totally unnecessary. This is particularly true given that there are other better and less damaging options, such as ***Solar*** *and* ***Wind*** *technologies.* Poor countries like Laos, Cambodia and Vietnam are better served developing these technologies and getting international funding and technical support to do so.

We conclude that *Hydropower is not only an unethical development, both environmentally and socially, but it is also unsustainable*.

A number of recommendations are offered, including that: ***the construction of large Dams must be discouraged and stopped worldwide.***

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Hydropower Dams vs. Mekong Dolphins' Extinction

The **Irrawaddy Dolphins** inhabit the Lower Mekong River, over a 190 Km stretch between Laos and Cambodia. T**here are only 78 critically endangered Irrawaddy Dolphins left** and they are **facing extinction**[1].

Irrawaddy dolphins (*Orcaella brevirostris*)- *via* fondationsegre.com

The Cambodian government, WWF and other NGOs are making a concerted effort to protect the Irrawaddy dolphins - a National Treasure to Cambodians - by reducing gill-net fishing and increasing surveillance of illegal fishing practices. This is commendable, yet futile.

The **biggest threat to their survival is a cascade of 9 Hydropower Dams,** both in construction and planned, on the main stream of the Mekong River in: Laos, the border with Thailand, and in Cambodia (see Map 1). Hydropower dams in the Mekong Basin have already had significant negative impacts on the livelihoods, food security, the hydrology and ecosystems of the Mekong River and its tributaries[2].

The future of the beautiful Irrawaddy Dolphins is doubtful at best, with **extinction** a most likely outcome – unless the planned Hydropower Dams are *cancelled*.

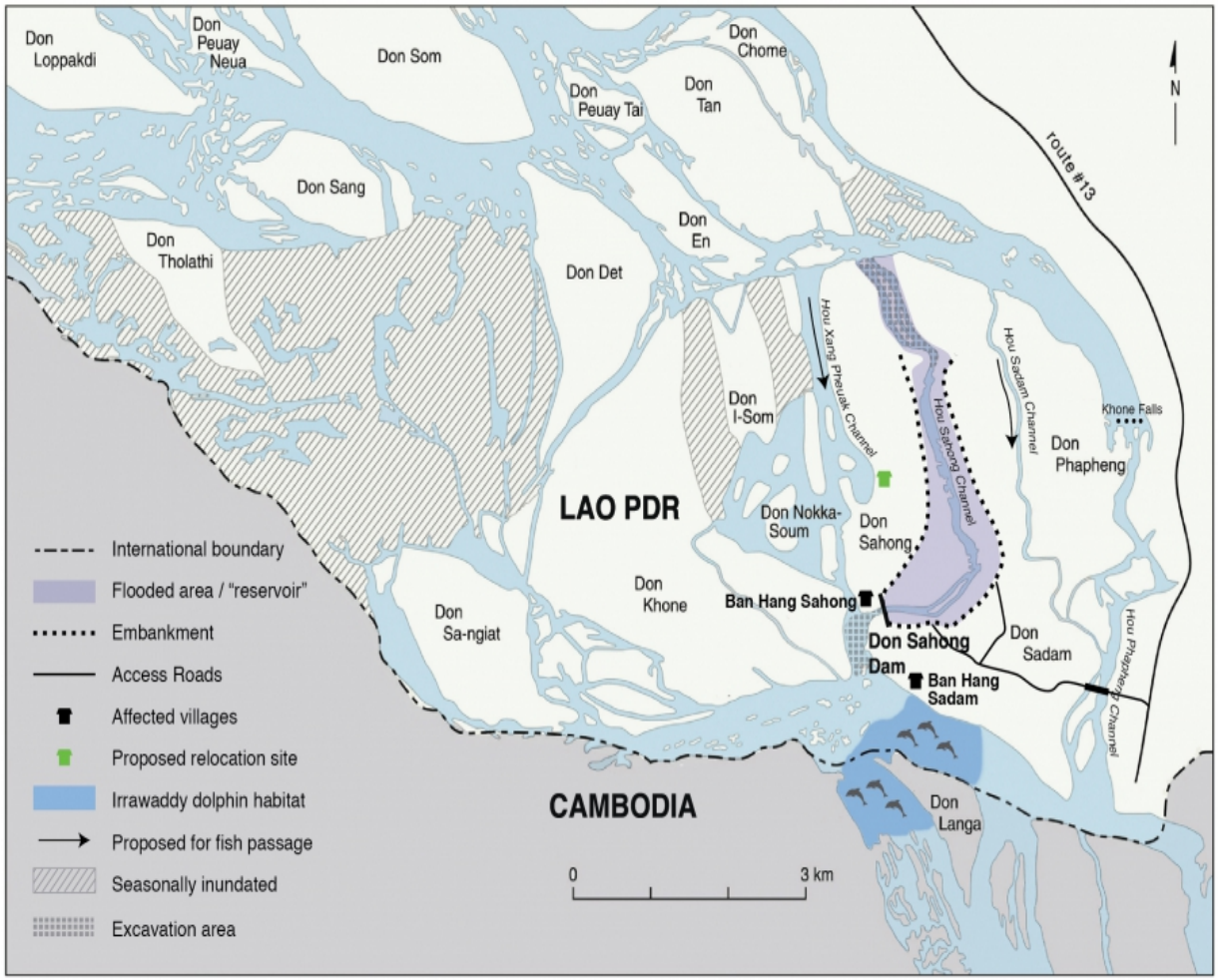
Laos is intent on becoming the *New Battery*[3] of SE Asia (under the tutelage of China and following its example of disregard for social and environmental consequences). The aim is to eradicate poverty and become a powerful nation in SE Asia. For this purpose, Laos plans to build a total of **nine** large dams on the main stream of the Mekong River and other dams in tributaries, no matter the cost to its own people and neighbouring nations that share the same river and its resources. The energy produced, will be mostly sold to China and Thailand – to satisfy the gargantuan consumption of energy by the big Chinese factories and the big shopping malls in Bangkok.

Laos is already building two controversial dams despite the strong opposition of other nations and NGOs: the **Xayaburi Dam**[4] (60% complete) in northern Laos, and the **Don Sahong Dam** [5] (started construction) in southern Laos.

At present there is a pod of only **four dolphins left** in southern Laos[6], near the border with NE Cambodia. Unfortunately*, the pool where these last Mekong dolphins reside happens to be located about 1Km south from the site of the controversial Don Sahong Dam* [7] (see Map 2).

Map 1. Existing & planned Dams on the Mekong River & tributaries - *via* savethemekong.org
Incomprehensible number of Hydropower Dams - in construction and planned on the Mekong River and its Tributaries. In effect, hydropower is killing the river and dispossessing 60 Million people.
It's like tying knots in a main artery… little water will flow and life will be eventually extinguished.

Clean Waters and Productive Water Ecosystems
Are the RIGHT of every Human, Animal and Plant on Earth



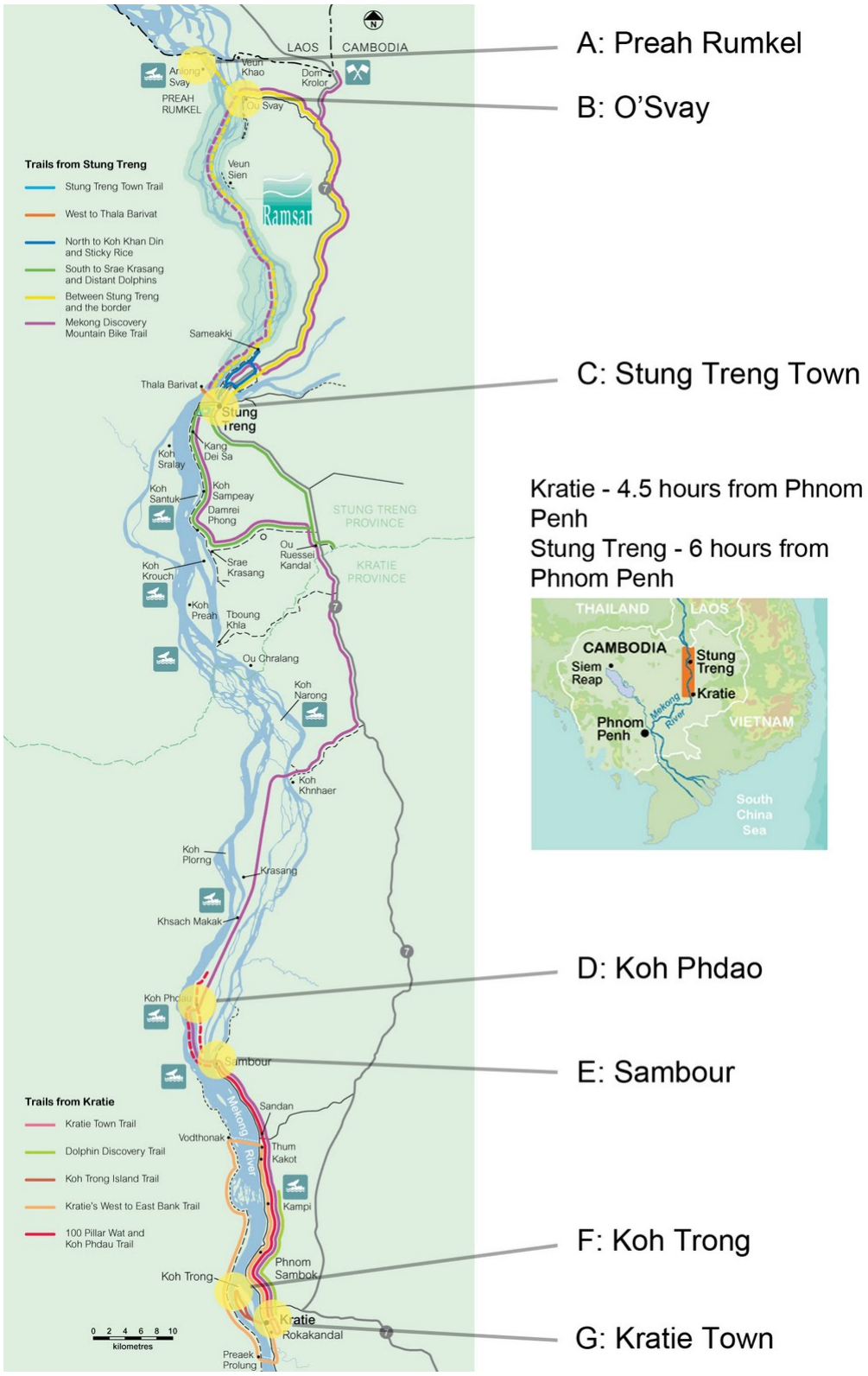
Map 2. Location of the **Don Sahong Dam (DSD) in Southern Laos** – *via* International Rivers 2014
The dolphin pool where **the last FOUR dolphins** live can be seen at the bottom of the map.

This pool is located 1Km. south of the Don Sahong Dam site, on the border with NE Cambodia. Cambodia also has two major dams planned for the main stream of the Mekong River a relatively short distance south of the Don Sahong Dam: the Stung Treng Dam and the Sambour Dam (see Map 3).

The latter is to be located precisely in the area where the largest pod of 20 – 25 dolphins live, north of Kratie [8]. Sounds like a conspiracy theory… but plans have been drawn and contracts have been signed.

if these 3 dams go ahead, the Mekong dolphin pods will be "sandwiched" between Dams.
Isolation, in-breeding, decrease in fish supply and lower water quality: will guarantee their extinction.

These dams will further guarantee the extinction of hundreds of fish species [9], including the rare Giant Catfish, known to migrate long distances and to pass through the Hou Sahong channel and the area of the Xayaburi Dam, all the way to northern Thailand and northern Laos.



Kratie - 4.5 hours from Phnom Penh
Stung Treng - 6 hours from Phnom Penh

Map 3. Map of Mekong Discovery Trail, NE Cambodia – via mikehaynesconsulting.blogspot.com

Areas where the last 78 Irrawaddy Dolphin live are marked with 'tails'. Note that at the top is Preah Rumkel on the border with Laos. The pool with only 4 dolphins left is here, only over 1Km south of the Don Sahong Dam in Laos. Other planned Dams are in Steung Treng and Sambour.

The Mekong dolphins will be "sandwiched" between these 3 dams, resulting in EXTINCTION.

Hydropower Dams vs. Fisheries & Biodiversity

The construction of Hydropower Dams on the main stream and on the main tributaries of the Mekong River will create a devastating domino effect.

Dams will significantly reduce fish reproductive success, which will impact on fisheries and biodiversity. This is because dams will effectively block fish migration routes and access to spawning grounds for fish and other aquatic species. This, in turn, will impact enormously on the economy of Vietnam and Cambodia through the loss of fisheries revenue.

The **Don Sahong Dam** in Southern Laos, is **located in the worse possible place in the Mekong River:** not only will it be *on a geological fault line*, and thus exposed to *tremors* that can make it collapse with disastrous effects for downstream communities. But, it is also *blocking* the ***Hou Sahong Channel,*** the most important year-round fish migration channel in this area of the Mekong River.

Notice the two very narrow streams on each side of the proposed dam reservoir area marked with arrows (in Map 2). These are the two streams the developer intends to expand as a *mitigation measure* to allow fish migration. This, however, is highly unlikely. These two streams are very narrow and shallow. In order to expand them and make them deeper, the developer will have to use a lot of explosives and remove large amounts of sediments. Such measures will undoubtedly *kill an important amount of local resident aquatic species, including some endangered fish species*, will increase turbidity, and *will certainly harm the last four dolphins*.

The WWF review of the EIA presented by the developer for the Don Sahong Dam [10] (Feb.2014), addresses this issue:

> *"The Environmental Impact Assessment (EIA) documents lack sufficient information to fully assess the potential impacts of the Don Sahong Dam on Mekong River fish runs. Because of this, and without further empirical evidence, the proponents' conclusions in the EIA that the project's "mitigation measures... recommended... will minimise the impact of this closure by enhancing migration pathways in two adjacent channels that will replicate the conditions in the Hou Sahong in both low and high flow seasons, so that the residual impact on upstream and downstream migrations will not be significant" are not credible.*
>
> *A baseline is not presented for the fish communities or migration rates in order to properly address the impacts on the fish communities and allow the monitoring after the beginning of the interventions on the river. The requisite baseline should include information on the species' distribution in relation to the hydropower-plant, preferential habitats (pools or rapids), reproductive behaviour (migratory or not), and other relevant information. These baselines should include not only the most important species for fisheries, but also the small sized ones, especially those potentially endemic from the rapids areas.*
>
> *The EIA's conclusion of no significant effects rests largely on a program designed to monitor fish fauna conditions and if they are found not to meet passage criteria, the proponents indicate that they will modify conditions to achieve desired goals. This strategy has the possibility of seriously impacting stocks and is largely "faith based". There is no evidence that their proposals to improve passage in adjacent channels will work to anywhere near the extent necessary to pass large volumes and variety of life-forms of fish, or that they could easily develop effective passage systems as presently envisioned.*
>
> ***Considering the technical features of the hydropower dam, and the magnitude of the local fish migration, it would be expected that fish are frequently killed.***
>
> ***It seems unlikely that the Don Sahong Dam will meet the MRC requirement in Article 61 of the MRC Preliminary Design Guide (Aug. 2009), which states, "that the developer should provide effective fish passage upstream and downstream**. Effective fish passage is usually defined as providing safe passage for 95% of the target species under all flow conditions". While the proposed passage systems may attain this level for some stocks of fish and some life stages of fish, it appears unlikely that it would attain this for all stocks of fish and which species must be targeted for passage is not yet clear.*

> ***The EIA and associated documents consists of at best sloppy and incomplete research, and fails to address a large number of potential and probable effects on fisheries.*** *The mitigation measures are unproven and unlikely to offset the dam. The monitoring plans are vague and misdirected, with baselines to be established during and after-the-fact, and are unlikely to provide timely warning of problems. In the event that the proposed mitigation measures do not work, there is no alternative plan or failsafe. Overall, if in the likely event the passage systems proposed for the Don Sahong Dam fail, permanent harm to some Mekong River fish populations and the millions of livelihoods they support will likely occur."*

It is important to understand that fish migration patterns happen in response to specific environmental cues, particularly: water velocity and water depth. There is no guarantee the fish will choose either of the two channels to migrate through, if the appropriate cues are not in place. And, if the *imprinted* migration pathways are changed.

An estimated 87% of fish species in the Mekong River are known to migrate long distances[11]. Some large catfish have been reported to migrate as far down as the Mekong Delta and the South China Sea and all the way up, through the Hou Sahong Channel (where the DSD is being built), to northern Laos and Thailand.

Given that migration also occurs during the dry season, most other creeks become too shallow to allow fish passage. What would appear to be viable passages both on the right and left of these streams, happen to be the Mekong River's biggest waterfall area, known as the Khone Falls area within it are a series of falls too high for fish to go up through them. The **Khone Phrapheng Falls** on the right of the Don Sahong island, and the **Sopheak Mitt Falls** on the south west of Don Khone island, **act as geographical barriers to upstream fish migrations**.

On the other hand, adults and many juvenile fish may get "bottle-necked" inside the Dam's reservoir on their *downstream migration*. They will most likely be *killed as they pass through the turbines*, further hampering the reproductive success of species and reducing biodiversity.

At present, the Xayaburi Dam and the Don Sahong Dam in Laos alone, will block the passage of all long distance migrating fish, thus hampering their reproductive cycle and reducing fisheries.

If other planned dams are also built the damage to the Mekong River ecosystem itself, to its fisheries and the millions of people dependent on them will be catastrophic.

A comprehensive long term study by Dr. Ian G. Baird, an Expert on Fisheries in the Mekong River examines important issues [12] :

> *"The Hou Sahong Channel has been shown to be the only channel that fish can easily pass year-round, and it is especially important for long-distance upriver dry season migrations. As most of these fish pass through the Hou Sahong Channel—which would be blocked by the Don Sahong Dam (DSD) —there is a high risk that the dam could cause serious impacts to fisheries far upstream in both northern Laos and northern Thailand.*
>
> *In addition, fish would not be able to complete their lifecycles upstream from the Khone Falls, and thus their populations downstream from the dam would also be seriously threatened, including important fisheries in the Tonle Sap in Cambodia and the Mekong Delta in Viet Nam. The Tonle Sap River and Great Lake support by far the most important fisheries in Cambodia, while the Mekong Delta in Viet Nam also supports large fisheries.*
>
> *Thus,* ***fisheries and associated livelihoods both far above and far below the dam would be seriously jeopardized by the DSD.*** *Furthermore, the fish stocks that could be lost upstream of the Khone Falls include a wide variety of species that are not only crucial for local livelihoods, but are also important for the overall ecology of the Mekong Basin.* ***These include the keystone minnow species,*** *Henicorhynchus lobatus (pa soi in Lao; trey riel in Khmer)****, which is an important source of food for many predatory fish species****, as well as* ***Irrawaddy dolphins in the Mekong River."***
>
> ***Mitigation measures*** *have been proposed in the DSD's draft environmental impact assessment,*

*but based on current knowledge and past experiences, they are **unlikely to be fully effective and the risk of severe impacts is high**. The record for fish passes in the Mekong region and globally is quite poor, and it would very difficult, if possible at all, to develop a fish pass that could accommodate all species during all seasons. In addition, it would be impossible to replicate the conditions of the Hou Sahong Channel in an adjacent channel, as possible alternative channels for fish passage are all much narrower, with greatly reduced water volumes.*

*Ultimately**, fisheries losses in the Mekong region from the DSD could negatively impact the nutritional status of hundreds of thousands or even millions of people dependent on these fisheries**, **thus decreasing the health of a large human population,** especially in parts of Laos, Cambodia and Thailand where nutritional standards are already low.*

Threatened Mekong fisheries are extremely important for meeting the nutritional needs of people in the region. Those living closer to the dam, both upriver and downriver from the project, would generally be impacted more than those located farther away. However, impacts would continue for well over a thousand kilometers, from the Mekong Delta in Viet Nam, past Cambodia, Laos and Thailand, continuing on to northern Laos.

Considering the DSD's wide and deep footprint, the project could ultimately make it much more difficult for governments in the region, especially those of Laos and Cambodia, to reach their health-related United Nations Millennium Development Goals, or their objectives for reducing poverty. For national governments and the international aid agencies that support them, the DSD should be a major concern."

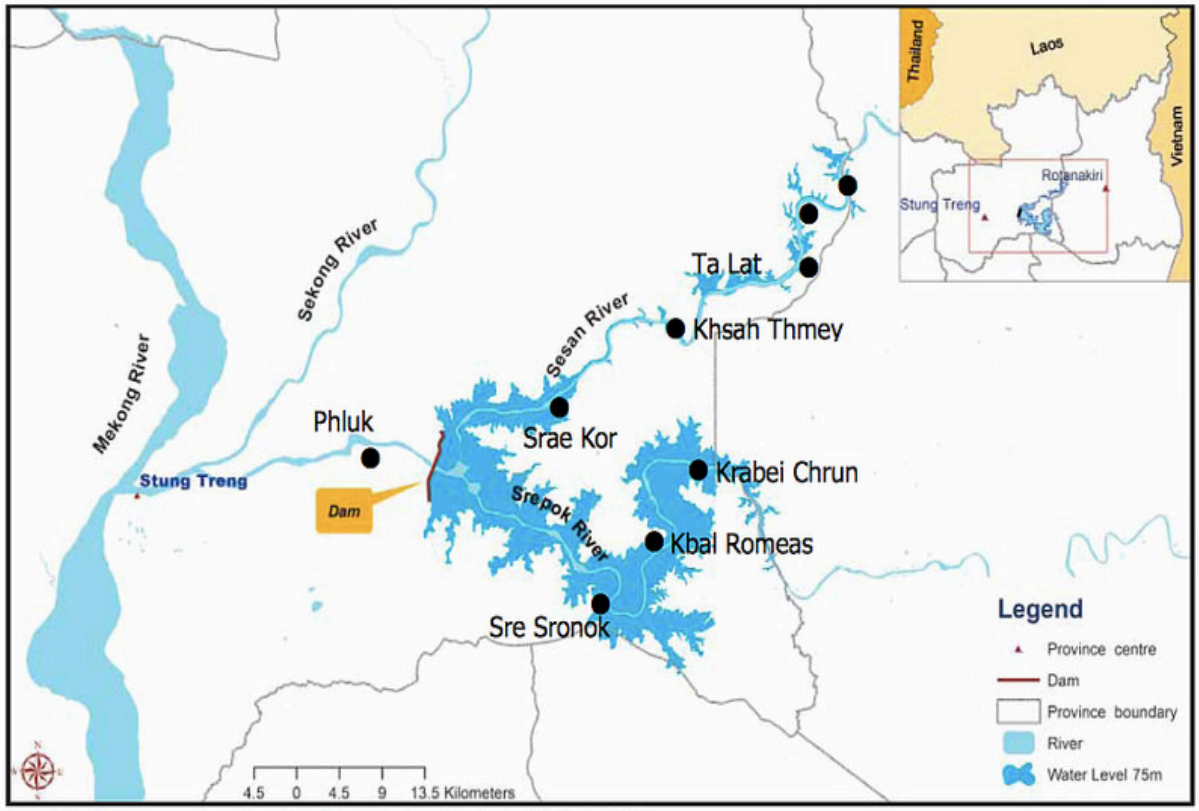
In relation to the endangered Giant Catfish, Dr. Baird reports in the same study:

*"There is some evidence that during the height of the rainy season the famous Mekong Giant Catfish (Pangasius gigas), 'pa beuk' in Lao, a species that reaches over 300 kg in weight, migrate past the Khone Falls from Cambodia each year, and that these large fish travel up the Hou Sahong Channel on what may be a very long migration… Although this species is considered to be endangered, some have been accidentally caught in traps set in **the Hou Sahong Channel** in recent years."*

Mekong Giant Catfish – Tonle Sap Lake – Cambodia – Photo: National Geographic

Unfortunately, not only the communities along the main stream of the Mekong River will be affected by the Don Sahong Dam or other planned dams. According to Dr. Baird hundreds of thousands of people living along or near Mekong River tributaries in NE Cambodia, such as the **Sekong, Sesan and Srepok Rivers**, in tributaries in southern Laos, and even in the Central Highlands of Viet Nam will also be negatively impacted through the loss of migratory fish.

Cambodia is at present building the large **Lower Sesan 2 Dam**[13] , [14]near the town of *Steung Treng* in NE Cambodia, at the confluence of *two main tributaries* of the Mekong, the ***Sesan*** and the ***Srepok*** *Rivers*. This dam will also block fish migrations and reduce the fish supply for both humans and dolphins alike.



Map 4. Map of the Lower Sesan 2 Dam in NE Cambodia – LS2 reservoir and major villages in the basin (Vicheka 2012) – via Vietnam Rivers Network – vrn.org.vn

It is clear that Hydropower Dams will ensure a significant loss in fish population density and fish species. This in turn, entails a massive loss of biodiversity [15].

As a result of all the above, **Hydropower Dams will put at risk the Food Security, Health and livelihood of 60 Million people in the Lower Mekong** [16] - in Thailand, Laos, Cambodia & Vietnam. Therefore, Hydropower dams are not sustainable projects.

In the study mentioned above, Baird [(11)] (2009, p.9) points out another issue of grave concern regarding the Don Sahong Dam location*: **the fact that it will be placed along a geological fault line.***

> *"The Khone Falls constitutes the only large complex of waterfalls and rapids area located along the lower mainstream Mekong River. Following a geological fault-line for approximately 9 km (Bramati and Carulli 2001), the Khone Falls are located approximately 760 km from the South China Sea.*
>
> *The Falls consist of a large number of small to large channels separated by many large and small islands and natural rock structures and seasonally inundated vegetation, creating a complex ecological system, one rich in aquatic resources (Daconto 2001).*
>
> ***Some of the channels that are part of the Khone Falls area have high waterfalls on them that make upriver fish movements impossible** (i.e. Khone Phrapheng Falls, Tham I Deng Falls, Somphamit Falls). These waterfalls can be considered **biogeographical barriers to fish migrations**, at least upward movements. In other cases, fish are able to migrate past small waterfalls and rapids under particular conditions and during certain times of year. In some cases, only a small proportion of fish that attempt to travel upstream are able to achieve their goal. Finally, there are a few channels that fish can migrate past, although sometimes in only small numbers, year-round. However, there is only one channel in the Khone Falls area through which fish can easily pass upriver year round: the Hou Sahong Channel (Roberts and Baird 1995)."*

The location of the DSD on a geological fault does not get enough mention. Yet, **it** is extremely important because *the Dam's stability is hugely compromised – by the fact that tremors are unpredictable along fault lines.* Thus, even light tremors could destabilize the dam and it may collapse, with disastrous effects to downstream communities.

The mix of tremor destabilization plus vast amounts of water during the rainy season, make up for an even worse recipe for disaster! *The Don Sahong Dam is undoubtedly a very **risky** investment!*

Hydropower Dams vs. Economic Losses

A major concern regarding the construction of upstream Hydropower Dams, **is the massive economic losses to Cambodia and Vietnam, through the loss of fisheries, agricultural products and alluvium rich soils.**

The hydropower dams will not only block fish migrations, but will also block the flow of nutrient rich sediments (*alluvium*) transported by the river. This will affect the productivity of riverine areas all the way down from the dam sites to the Mekong Delta. Food cultivation along the Mekong River and fisheries will both suffer by lack of nutrient rich sediments.

Indeed, the loss of sediments by upstream dams in the Lancang River in China and other main tributaries of the Mekong, *is already noticeable both in riparian zones* (along the sides of the river) and *in the Delta.*

If the Hydropower dams area allowed to be built, this will result in a loss of thousands of hectares of very productive soils and the intrusion of salt water in the Mekong Delta [17], [18], [19].

The Mekong Delta is the "Granary of SE Asia" and home to nearly 20 Million people, who depend on the Delta for their food and livelihood. The loss of sediments to the Delta will be disastrous to the ecosystem itself, to the fisheries, as well as, to the production and export of fruits, vegetables and **rice**.

Dr. Le Anh Tuan, Deputy Director of the Climate Change Research Institute at Can Tho University in Vietnam's Mekong Delta, has been an active opponent of Hydropower Dams in the Mekong River and its tributaries, both in personal communications with me and publicly[20] :

> *Dr. Le Anh Tuan, deputy head of the Institute of Climate Change Research at Can Tho University, said in a report that Vietnam, especially the Mekong Delta, would see little benefit from hydropower damming on the Mekong River.*
>
> *Damming will directly hit agriculture and fish farming, the two biggest economic pillars of the region, leading Vietnam to lose its position as the largest food exporter in the world. In addition, the damming projects will destroy biodiversity and affect poor people both in cities and rural areas.*
>
> ***Each year, the Mekong River carries around 160,000,000 billion tons of alluvium from the upstream to the sea**, ranking sixth among the 10 largest rivers worldwide in terms of alluvium. The Mekong Delta, which is home to nearly 20 million people, four million hectares of natural land and **two million hectares of agricultural land producing 25 million tons of paddy and 2.8 million tons of seafood a year, depends heavily on alluvium from the river**.*
>
> *However, dams will cause a reduction of alluvium, making soil exhausted and thereby affecting output of rice and other crops.*
>
> *Quoting a report of the International Center for Environmental Management (ICEM), **Tuan said** the dam system would cause a **loss of 440,000 tons of aquatic resources worth US$1 billion a year**.*

A two and half year study commissioned by the Vietnam National Mekong River Committee [21]– to be released in December – calculates that the Lower Mekong Basin will loose about 630,000 tons of fish resources between Cambodia and the Vietnam Delta, as a result of the Hydropower Dams.

Therefore, Hydropower Dams will result in a massive economic loss to Cambodia and Vietnam, will alter the Mekong ecosystem, and put at risk the Food Security and livelihood of 60 Million people in Laos, Thailand, Cambodia and Vietnam…

This can hardly be called "No Harm" as claimed by the Laos government and developers of both dams.

Hydropower Dams vs. Community Displacement & Compensation

There are still more impacts of dams to add to our long list. **The relocation of tens of thousands of people displaced by the dams** will effectively create a new wave of **"refugee camps" in SE Asia**. Moving communities from the river to remote areas away from the river and giving them new houses and roads, does not amount to *appropriate compensation*. There is no real compensation when displaced communities whose livelihood depends on *fishing* are being relocated *far from rivers* to areas with poor soils, which also hampers productive agriculture.

An analysis on the relocation of communities to make space for the Nam Theun 2 Dam in Laos, by International Rivers after 5 years reveals [22] :

> *"In the years since they were relocated, the resettled communities still struggle from the loss of their traditional livelihoods, having lost access to their paddy and swidden fields, forests, and grazing lands.* ***The poor quality and small size of land parcels in the resettlement sites continues to cause problems for villagers, who are unable to grow sufficient food or retain livestock.*** *Given the limited space on the Nakai Plateau, many of the families have sought ways to purchase land elsewhere or earn income from farming family lands in distant locations.*
>
> *Meanwhile, fish stocks in the reservoir – meant to replace riverine fishing as a long-term livelihood – have declined significantly, and restrictions on access to the reservoir, including licensing, has meant that* ***the predicted income boom from reservoir fishing for resettlers has not been borne out in reality.***
>
> *While the initial investments in infrastructure have been impressive and significant, their sustainability is in jeopardy without dedicated funds for maintenance and repairs, nor adequate for a growing population. More importantly, the project's plans for ensuring that their livelihoods are recovered and sustained over the longer term have not borne out."*

According to CGIAR[23], communities are meant to be financially compensated for their losses but rarely are:

> *"Lao PDR has passed international standard class laws and regulations related to hydropower that are meant to act as social and environmental safeguards.* ***The reality on the ground rarely lives up to these regulations.***
>
> *"VFI's (Village Focus International) gap analysis found that hydropower-affected communities and local government officials have little understanding of the rules and regulations guiding resettlement. There is also minimal coordination and communication between central and local government bodies."*

In reality, displaced communities are put under enormous stress and despair by loosing their homes, property, livestock, means of livelihood, cultural sites, and by having to learn or work out another means of survival. The cost of having new houses and roads, in an unknown area they never chose nor had a voice to oppose, and no food security, hardly amounts to a fair compensation. In effect, **forced displacement and the suffering it entails: is a violation of Human Rights.**

Another topic of grave concern is the disastrous consequences of unscheduled ***flash flooding*** **by upstream dams on *downstream* communities. This has already occurred, resulting in the destruction of houses, farms, livestock and even killed people.** Thus, these predictions are based on real facts, rather than on speculation. Radio Free Asia reported such a case occurring in Southern Cambodia[24] on the 16 September 2015:

> *"Local government officials in a southern Cambodian province **failed to evacuate villagers in time** to prevent their homes and rice fields from flooding after a Chinese-built hydropower dam informed them (only) a day earlier that they would open the facility's gates to release excess water from heavy rains…*
>
> *The water from the dam flooded nearby rice paddies and the homes of 1,571 families in three communes in Chhouk district…*
>
> *"The villagers have lost their livestock and their belongings. We assume that when the water recedes, fruit trees like the banana and papaya trees, will have been destroyed."*
>
> *Chinese-backed hydropower projects constructed in Cambodia's Mekong River region, including dams in the southwestern provinces of Koh Kong and Pursat provinces, have all raised concerns among locals and rights groups about their social and environmental impacts."*

These types of disasters will most likely re-occur in the future and may even be *intensified* by Climate Change***. In the tropical areas of the Lower Mekong region, it is highly probable that during every rainy season, upstream flooding will force dam gates to be opened causing flash floods downstream,*** putting already poor farmers and fishing communities in danger, under stress and further poverty.

Dam developers *do not offer any compensation* for loss of property or loss of food supply to communities either upstream or downstream from the dams. In the above disaster **no compensation was offered to the 1,571 families** whose properties and lives were devastated by the flash flood … Dam developers must understand that, even if advised with more time, *downstream communities cannot very well pack up their houses, lands, harvests and livestock, **and move them out of harms way** so they can continue operating their dams…*

In other words, not only are poor communities put in danger, their meagre properties destroyed, their livelihoods jeopardized, but they are also **pushed into further poverty and despair by Hydropower Dams**.

Dam developers should include in their budgets the funds necessary to also offer compensation to communities living in downstream riverine areas and in Wetlands for: loss of houses, loss of livestock, loss of harvests, loss of aquaculture ponds and loss of food supply.

Hydropower vs. Damage to Wetlands

There are yet other ecosystems and human communities, which are seldom mentioned and who will suffer greatly from the construction of Hydropower Dams. These are, **the Wetland areas** of the Mekong and its tributaries, and the people living there.

Wetlands are not only **very important Carbon Sinks**, but also rich ecosystems that provide shelter for hundreds of species of fauna and flora. The wetlands are also home to large communities of people who share their bounty.

The RAMSAR Wetlands of NE Cambodia, **are located *downstream* from the Don Sahong Dam** – between the towns of **O'Svay** and **Stung Treng** (see Map 3). These wetlands are the home to over 20,000 people of different ethnic groups.

The Don Sahong Dam will certainly damage these RAMSAR Wetlands – through the extreme fluctuations in water flows during the dry and wet seasons. Although it is true that these wetlands are already exposed to variations in water volumes, the Don Sahong Dam will exacerbate the drainage (in the dry season) and flooding (in the wet season), coupled with extreme weather patterns caused by climate change.

The wetlands will loose their ability to be the amazing Carbon sinks they are at present, because of **the extreme loss of water during the dry season**. At this time, the dams' reservoirs will store water

that would otherwise flow through the wetlands and be available to the flora, fauna and human communities that depend on it. As a result, **the wetlands will dry out and emit in excess the CO^2 and methane gases stored in its soils**.

Moreover, hundreds of species of flora and fauna that depend on *some level of water* during the dry season (thereby the name wetland) will either perish or suffer a severe decline. This in turn, will **deplete the food supply and the water supply, and affect deleteriously the 20,000 people living here.**

On the other hand, **during *every* wet season, the Wetlands will most likely be exposed to sudden flash flooding** – ***caused by upstream dams*** forced to release excess water to prevent the collapse of the dam after excessive rains.

Such man-directed floods may have disastrous consequences for communities immediately downstream (south) of the Don Sahong Dam, such as **O'Svay** and **Preah Rumkel**. Flash floods will most likely have devastating effects on the Wetlands' communities, their crops, aquaculture ponds and livestock. Flash flooding may also endanger people's lives downstream. Furthermore, the very existence of aquatic flora and fauna, and bird populations will also be threatened.

As mentioned above, Dam developers must offer compensation to communities living in Wetlands downstream of dams for loss of houses, loss of livestock, loss of aquaculture ponds and loss of food supply.

As mentioned above, an extremely dangerous threat to downstream communities both along the river and in the adjacent wetlands, is the very real possibility of the collapse of the Don Sahong Dam, as a result of tremors, given that it will be built on a geological fault line – with incalculable disastrous consequences.

Hydropower vs. International Law & Water Shared Governance

The **"No-Harm Principle"** is a due diligence obligation of prevention. It is recognized as a general principle of international law and must be respected. Yet, Laos is already building two very damaging dams on the Mekong main stream: the **Xayaburi Dam**[25] and the **Don Sahong Dam.**

Xayaburi Dam in construction, Northern Laos, now 60% complete – *via* The Stimson Centre[26], stimson.org

The construction of these two controversial Dams went ahead despite strong opposition from Vietnam[27] and Cambodia[28], [29], and before a comprehensive EIA is released in December… Therefore, Laos is breaching International Convention Laws on Transboundary Water Governance.

The Mekong River Commission (MRC) the body created to regulate shared water governance of the Mekong, could not achieve a unanimous decision and in June 2015 handed over the problem to the governments of Laos, Thailand, Cambodia and Vietnam asking them to decide the fate of the Don Sahong Dam[30].

The legal framework of trans-boundary impacts is clearly summed up in an anonymous blog[31] published by International Rivers:

> *"When it comes to dams and other projects with potentially large trans-boundary impacts, the Watercourses Convention, unlike the Mekong Agreement, clearly defines the rights and responsibilities of both parties. If after six months the parties cannot reach agreement, the convention mandates the formation of a fact finding commission to provide impartial information on the proposed project. If agreement cannot be reached, the convention allows the dispute to be referred to the International Court of Justice in The Hague. Meanwhile,* ***the convention prevents the proponent from starting construction until agreement is reached.*** *(Starting construction before an EIA is complete is common practice in the Mekong region.)… The convention also applies to the entire river system, not just the mainstream.*
>
> *In effect, while the Mekong Agreement puts the burden of proof on the plaintiff, the Watercourses Convention puts it on the project proponent, a key difference…*
>
> *"****Sustainable development requires that unnecessary risks to ecosystems and environmental services, such as fish production and biodiversity, be avoided****."*

Unfortunately, based on the information above, Hydropower dams are definitely *not* a sustainable development. Well on the contrary, there is mounting evidence of the **great harm** resulting from the construction of the Xayaburi Dam, the Don Sahong Dam, and all other nine dams planned in Laos and Cambodia to the Mekong River and its tributaries at social, ecological and economic levels.

Hydropower vs. Human Rights Violations

To add another nail to the coffin of the Mekong, the public must know that **Hydropower Dams are being built on *Human Rights Violations*** [32], [33].

4. The developers and the governments of Laos, Cambodia and Thailand have not implemented appropriate Environmental Impact Assessments [34] (EIA), thus jeopardizing the Mekong communities lives, food supply and livelihoods.
5. **The forced displacement of communities** to make space for the reservoirs of Hydropower dams constitutes a violation of Human Rights.
6. There has been little and substandard community consultation[35].
7. The **right to Free, Prior and Informed Consent** (FPIC) by affected communities is **simply not possible in Laos** [36], [37] because people are too afraid to talk (see my report in separate article).
8. **Ban on Freedom of Speech in Laos with severe sanctions imposed** on locals, activists, journalists and foreigners alike. Under **Penal Code 46** any opposition or criticism of government's policies or projects incurs a jail term of 5-15 years and a fine. This includes *online criticism* of the Laos Government [38].
9. Dams are being built **despite the communities' opposition** [39], [40], [41], [42].
10. **Jailing, killing or disappearing activists and journalists** for opposing or reporting environmental issues constitutes a violation of Human Rights[43], [44]. In Cambodia environmental activists are also jailed [45], [46], deported[47], [48] and even killed[49]. A Journalist has also been killed [50].
11. Human Rights are violated by **subjecting displaced communities to intense suffering**[51] – psychologically, physically and emotionally – as a result of:
    - Being uprooted from their homes

- Losing their property and livelihood
- Being relocated to unknown areas far away from the river and the life they know. And,
- Having to discover a new way to make a living.

12. **Lack of compensation for the losses incurred by communities upstream and downstream from dams, also amounts to a violation of Human Rights.** These communities are not even considered for compensation despite being extremely affected by the Dam's changes in river flows, blockage of fish migration routes and loss of fish supply. **Upstream communities are affected by *loss of water*** vital for their fields and aquaculture. While **downstream communities are affected by *flooding and loss of property*.** Dam developers, however, only offer compensation to the communities *displaced* by the creation of the dam reservoir area.

The violation of Human Rights associated with Hydropower development and many other environmental issues has prompted the Earth Rights Institute (ERI) to call on the UN Rapporteur for Human Rights and Environment to intervene[52]. Although not specifically aimed at the projects in Mekong River in so many words, but to projects all over the world, it raises the same important issues.

The ERI placed a submission[53] offering recommendations and asking the UN Rapporteur to take action.

> *"The International Watercourses Convention sets out State duties to conduct assessments, notify and consult with other States around planned uses on shared watercourses; however, **it does not address the duties of non-state actors or specific obligations with respect to affected populations, such as public participation, free prior and informed consent, and access to remedy."***

In this submission ERI offers **"Proposals regarding Trans-boundary Harm and Human Rights"**:

> *"The UN Guiding Principles on Business and Human Rights provide guidance on the respective obligations of governments and business in relation to the human rights impacts of business activities, including requirements for human rights due diligence and access to remedy.*
>
> *ERI would like to offer the following proposals with the aim of implementing element (a) of the Special Rapporteur's mandate:*

- *Conduct a comprehensive global study to monitor and investigate the human rights implications of transboundary environmental harm, and the existing procedural and substantive protections contained in national and international laws and their implementation, including in less developed states and weak governance zones. The study should identify and examine the role of both state and non-state actors and their respective obligations and liabilities with respect to transboundary harm.*

- *Clarify the obligations under international human rights and environmental law for state and non-state actors with respect to transboundary environmental harm. Particular attention should be given to important procedural requirements for both state and non-state actors, including due diligence, transboundary environmental impact assessment, requirements for notification and consultation, as well as obligations to ensure non-discrimination, access to information, public participation, free prior and informed consent and access to remedial mechanisms for affected populations."*

ERI also offers **"Proposals to enhance understanding of Free Prior and Informed Consent"** (FPIC):

> *"The right to free, prior, and informed consent (FPIC) is the right of communities, particularly indigenous communities, to participate in consultations around proposed projects that may affect their lands and livelihoods, with full access to information, and to freely give or withhold their consent on such projects.*
>
> *ERI would therefore like to offer the following proposals with the aim of addressing the above issue and implementing elements (a), (b), and (c) of the Special Rapporteur's mandate:*

- *Create and publish a best practice compendium surrounding FPIC, including a diagnosis of minimum elements for adequate FPIC rights implementation. Ensure that any compendium highlights the need for states to adhere to these FPIC best practices at every stage of a project's life-cycle, from initial planning and project construction to the operation and post-project dismantling stages. Furthermore, ensure that the compendium distinguishes situations where FPIC consultations cannot cure the defects of an illegal state action, such as instances where the proposed development and its* ***impact*** *on local communities* ***would constitute a prima facie violation of international law."***

Let us hope the UN Rapporteur for Human Rights and Environment will follow the recommendations by EIR, and help bring some sense of democracy and respect for people's rights in the region; and, promote the protection of such an important ecosystem as is the Mekong River Basin, as well as, so many others in the Amazon and Africa.

Hydropower Dams vs. Climate Change

To this list of harmful impacts by Dams, it is important to add yet another very important factor: **the impacts of Hydropower Dams on Climate Warming**[54]. Little is known by the public on this subject despite the fact that *the Green House Gas (GHG) emissions by Dams has been extensively studied and debated for over two decades,* particularly through research on Hydropower dams in the Amazon basin.

The most vocal of researchers has been Dr. Philip M. Fearnside, a leading scientist at the National Institute for Research in Amazonia (INPA) in Manaus, Brazil. He is a world authority on the impacts of Hydropower Dams on Climate Warming, having studied dam's emissions for over 20 years. His studies are numerous, therefore we will reference mostly some publications in English[55] (he has many publications in Portuguese and Spanish).

Dr. Fearnside's findings and those by other scientists have been met with ***extreme resistance and controversy*** **fuelled by the Hydropower industry**, which to this day has won the debate… judging by the fact that most governments and the public are unaware that Hydropower is NOT a Green Clean Energy, nor that it is unsustainable. However, this is changing as the topic is crucial to the Climate Change negotiations taking place in Paris as we speak.

Dr. Fearnside explains clearly how GHG are emitted by Hydropower Dams, and the controversy his findings have sparkled – in one of his earlier articles **Why Hydropower is Not Clean Energy** (2007) [56]. See the excerpt below:

> *"Hydropower is generally presented as "clean energy," at least from the perspective of global warming. Of course, hydroelectric reservoirs are well known to have other severe impacts, such as displacing human populations, flooding terrestrial ecosystems and radically altering aquatic ones. Unfortunately, greenhouse-gas emission represents a significant additional impact of many dams, especially in the tropics. The hydropower industry has reacted strongly to disparage these findings, but successive confirmation of the results makes this resistance harder and harder to justify.*
>
> *"It's baloney!" was the initial response of the industry, as voiced by a spokesperson for the U.S. Hydropower Association (see McCully, 2002). What had sparked the reaction was my calculation that Brazil's Balbina Dam was worse than fossil fuels in terms of greenhouse-gas emissions (Fearnside, 1995). A Canadian group had also shown that northern reservoirs can release greenhouse gases (Rudd et al., 1993). This was only the beginning of the long debate that continues to this day. Large emissions from water passing through the turbines of tropical dams have been have confirmed by direct measurements of methane release immediately below the Petit-Saut Dam in French Guiana (April et al., 2005) and the Balbina Dam in Brazil (Kemenes et al., 2006).*
>
> *In 2002, I published a paper in the journal Water, Air and Soil Pollution calculating that in 1990, Brazil's Tucuruí Dam (then 6 years old) released even more greenhouse gases than the city of São Paulo (Fearnside, 2002). Once again, shock waves were set off. The head of ELETROBRÁS (Brazil's government agency for promoting hydroelectric dams) claimed that the study showed that those who say that dams have high emissions (that is to say, me) are subject to "the lures of the*

thermo-power and nuclear-power lobbies." (Rosa et al., 2004; See reply: Fearnside, 2004) …

The important fact is that the water at the bottom of a reservoir is under high pressure and contains a high concentration of dissolved methane. When the pressure is suddenly released as the water emerges from the turbines, most of this methane is released.

Methane accumulates in the water near the bottom of the reservoir because the water column is thermally stratified (generally at a point less than 10 m below the surface), such that the colder deep water does not mix with the warmer surface water. Since the deep water (hypolimnion) has virtually no oxygen, decomposition ends in CH4 rather than CO2. Organic matter undergoing decomposition comes both from what was originally present in the vegetation and soil before the reservoir was formed and from carbon that enters the reservoir each year, one example being from the soft vegetation that grows on the mudflats that are exposed annually when the water level is drawn down, only to be flooded again when the reservoir is refilled. Unlike a natural lake where an outlet stream draws water from near the surface, a hydroelectric dam is like a bathtub where one pulls the plug at the bottom—outflow is through turbines and spillways that are located at depths where the water is loaded with methane. Although the emission is greatest in the first years after a reservoir is filled, ***the annual flooding of the drawdown zone can sustain an appreciable level of emission permanently*** *(Fearnside, 2005).*

Since one ton of methane is equivalent to 21 tons of CO2 in terms of impact on global warming, according to the conversions adopted under the Kyoto Protocol, ***this gas release gives hydroelectric dams a significant contribution to the greenhouse effect.***

Omissions of methane from the turbines and spillways is the main reason why my estimates of greenhouse-gas emissions from Brazilian hydroelectric dams are more than ten times higher than the official estimates Brazil submitted to the Climate Convention in its national inventory (Brazil, MCT, 2004, p.154; 2006). It is relevant to mention that the official responsible for Brazil's national inventory confessed in a singularly public way that ELETROBRÁS had been invited to "coordinate" the portion of the report on hydroelectric emissions specifically because the agency would produce a politically convenient result that would avoid international pressure for Brazil to reduce its emissions (Brazil, MCT, 2002; see Fearnside, 2004).

… Both sides of the controversy are available in the "Amazonian Controversies" section at http://philip.inpa.gov.br .

Since then, many other studies have confirmed that **Hydropower Dams *intensify Climate Change*** rather than produce *Clean and Green Energy* as advertised. Particularly in tropical regions, dam reservoirs produce ***continuous*** **emissions of very high levels of CO^2 and Methane gases** into the atmosphere [57]:

"Organic material—vegetation, sediment and soil—flows from rivers into reservoirs and decomposes emitting methane and carbon dioxide into the water and then the air throughout the hydro-electric generation cycle. Studies indicate that where organic material is the highest ***(in the tropics*** *or in high sediment areas)* ***hydro-electric dams can actually emit more greenhouse gases than coal-fired power plants.***

"Dams are the largest single [human-caused] source of methane, being responsible for 23 percent of all methane emissions due to human activities."

Large dams contain enormous amounts of cement, which during the construction process uses massive amounts of energy that emits greenhouse gas emissions. For one medium-sized dam project proposed for the Cache la Poudre River in Colorado, it is estimated that the construction would emit 218,000 metric tons CO2-equivalents which equals the emissions from almost 46,000 automobiles on the road for one year. Larger dams, such as Hoover Dam which contains 4.36 million cubic yards of concrete, would have exponentially higher climate change impacts from construction. The largest hydro-electric dam on the planet—the Three Gorges Dam in China—contains 27.15 million cubic meters of cement.

Dams that divert water out of rivers may have significant additional climate change impacts because they drain and dry up downstream wetlands that are "carbon sinks" holding vast amounts of greenhouse gases in soils. This draining and dry-up causes carbon and methane to be released and emitted into the air. A proposal for a dam on the Cache la Poudre River in Colorado would dry up

1,700 acres of wetlands thus emitting about 7,000 metric tons of CO2 equivalents. As just one more example, when the Colorado River was diverted and drained, the dams and diversions dried up about 2 million acres of wetlands in the former Colorado River Delta—the climate change impact of destroying those wetlands was likely staggering."

The impacts of Green House Gases by Hydropower dams on Climate Change have been ratified [58] and ought to be a central point of discussion at COP21. The Social Cost of Carbon Emissions [59] and its economic effects also need to be taken into consideration in such discussions.

Even the International Hydropower Association (IHA) quietly recognizes now that the reservoirs of Hydropower Dams are producing serious Green House Gas (GHG) emissions [60]. So much so, that IHA recently released *a **tool** to measure the GHG emissions* generated by Hydropower reservoirs. But it stops at that. Although emissions are measured the IHA does not offer any suggestions or actions to counterbalance such emissions… In effect, the only action possible is to decommission the dams and tear them down.

Despite all the above damning evidence, Hydropower Dams continue to be built. Unfortunately, hydropower is promoted by the *unaware* media based on the *false notion* that hydropower produces CLEAN energy, and it is a great tool to **reduce harmful emissions** that cause Climate Change.

An example, is an otherwise very good interactive article on Mekong issues published by The Guardian[61]. Here is a contentious excerpt:

"Laos, Cambodia, Thailand and Vietnam who share the lower Mekong basin are all acutely aware that they are threatened by climate change caused by others. The region has recorded more extreme weather, deeper droughts, heavier rains, bigger floods and much hotter temperatures than ever before - all consistent with UN scientists' predictions of global warming. The four Mekong countries go to Paris for next week's UN meeting on climate change with ambitious plans to develop with clean power.

Laos, lobbied strongly by Chinese, Thai and Korean engineering firms, wants to address climate change and is engaged in a frenzy of dam-building along the Mekong and its tributaries. In the next 15 years, it plans to build 70 or more major dams, including seven across the full width of the river.

*The intention is partly **to reduce its own minimal greenhouse gas emissions,** but mostly to generate income from selling clean electricity to its energy-hungry neighbours.*

Laos hopes to make billions of dollars a year from its cascade of giant dams anyway, but it could be one of the great winners from the Paris climate summit if a global carbon market develops and rich countries are allowed to offset their emissions against its clean energy."

The above article reveals many concerning issues, in particular:

- Laos intention to build 70 dams in the Mekong Basin, which spells disaster not only for the River's ecosystems, but for the massive alteration of the hydrological flows of the region; as well as, the disastrous impacts of loss of water for the people, their crops and livelihoods.
- The fact that the Hydropower industry continues to manipulate and dupe the media and the governments alike, through **false** advertising is apparent. They use **2 key words** for Hydropower: AFFORDABLE – CLEAN!
- The media condones Laotian efforts to 'reduce poverty' *via* hydropower, and by doing so, the media actually *promotes* the false notion of Hydropower as an answer to alleviate poverty and Climate Change. Hence, journalists *inadvertently* pass on this false information, while unaware of the damage they are doing. And,
- It is apparent that some journalists are not aware that there is already a *Clean Development Mechanism* (CDM) in place under the Kyoto protocol, by which countries have been offsetting emissions through Hydropower for over a decade…

Below we offer our translation from Spanish of an article by Dr. Philip M. Fearnside (2014) [62], on the issue of Hydropower Dams and Carbon credits:

> *"The Green House Gases emitted by dam reservoirs are Carbon dioxide, resulting from the decomposition of flooded dead trees, and Nitrous Oxide, specially Methane emitted by the reservoirs' waters, as well as, when the waters pass through the turbines and spillways.*
>
> *Under the Clean Development Mechanism (CDM) of the Kyoto Protocol,* ***Carbon credits for reservoirs already represent an important additional source of impact for global warming****, because almost all the dams that offer such a credit will be built in the same way, i.e. without this subsidy. This in turn, means* ***that countries who buy such credits can emit gases without an authentic offset to neutralize the impact of their emissions****. The way in which dams are compared to fossil fuels often distorts the results, particularly in relation to the value with time.*
>
> *The impact of dams is much worse compared to that of fossil fuels, if the calculations are done in a way that represents the best interests of society.*
>
> *… Standards for dams and other development projects have been put in place by the World Commission on Dams (WCD) and other organizations. Rather than a lack of standards, the fundamental cause of problems associated with dams is the* ***failure to comply*** *with existing standards.*
>
> *Recommendations include addressing: the underlying issue of how electricity is used; a change to emphasize development of alternative energies; conservation of electricity; evaluation and democratic discussion of costs, environmental and social benefits before the final decisions are reached; efforts to minimize political pressure on environmental agencies; mechanisms to carry out impact assessment studies that are not financed by the proponents of the projects; put an end to the carbon credits for dams; respect for environmental legislation; constitutional guarantees to international treaties; and finally, a decision making that gives more value to the human impacts, rather than to money.*

Very important for COP21 – Is the fact that **Hydropower emissions are not properly counted**, which affects crucial **Emissions limits** being discussed at present [63] :

> *"Tropical hydroelectric emissions are undercounted in national inventories of greenhouse gases under the United Nations Framework Convention on Climate Change (UNFCCC), giving them a role in* ***undermining*** *the effectiveness of as-yet undecided* ***emission limits****. These emissions are also largely left out of the Intergovernmental Panel on Climate Change (IPCC) Special Report on Renewable Energy Sources and Climate Change Mitigation, and have been excluded from a revision of the IPCC guidelines on wetlands. The role of hydroelectric dams in emissions inventories and in mitigation has been systematically ignored."*
>
> *…* ***"Tropical dams, especially those in the wet tropics, emit substantially more greenhouse gases than do those in other climatic zones*** *(see extensive review by Barros et al., 2011).*
>
> *This is reflected in life-cycle studies: a review by Steinhurst et al. (2012) concludes that tropical dams emit 1300-3000 g CO2e/kWh, versus 160-250 g CO2 e/ kWh for boreal dams, with thermoelectric plants using natural gas, oil and coal emitting 400-500, 790-900 and 900-1200 g CO2e/kWh, respectively.*
>
> *As an illustration, emissions can be calculated for the Petit Saut Dam in French Guiana, which is the best-studied tropical dam for greenhouse gas emissions. A 20-year calculation is given in Table 2, including a comparison with production of the same amount of electricity from a combined-cycle natural gas plant. The 20-year period is the relevant time frame for maintaining mean global temperature from passing the limit of 2°C above the pre-industrial mean (see section 3.7).*
>
> *The comparison indicates 22 times more emission (g CO2e/kWh) from the dam as compared to natural gas based on a 20- year GWP for converting methane to CO2e (see section 3.6). Even if the 100-year GWP is used the dam has 19 times more emission in the first 20 years.*

In a very important recent article, Dr. Fearnside[64] explains Hydropower in relation to the Clean Development Mechanism (CDM) and the problems associated with Carbon Credits for Hydropower dams.

Another issue of grave concern are the impacts of Hydropower dams and climate change on the Mekong Delta. WWF hydrologist Mark Goichot, who has been studying the Mekong delta's vulnerability to ecological change is quoted as saying [58] :

> *"If the dams are built then you can expect food security to be hit seriously. Deltas are rich and fragile. Coastal erosion is increasing, nutrients are being lost. The delta is sinking and its channels are getting deeper. Now the sea is encroaching. If the projected dams in Laos and Cambodia are built then you can expect food security to be seriously hit" said Goichot.*
>
> *In 1990, he said, 160m tonnes of silt was brought down the Mekong and reached the sea. Now only 75m tonnes gets there. "Nearly 50% of its sediment does not reach the sea any more. Vast amounts of sand are being taken for construction of cities and* ***the silt that is used for farming is being stopped by dams****. If sea levels rise by even 50cm, as predicted within 50 years, then millions of people would be forced to leave."*

Dr. Le Anh Tuan, Deputy Director of the Research Institute for Climate Change at Can Tho University, in the Mekong Delta, was also quoted as saying [58]:

> *"****If sea levels rise one metre, 20% of the delta is affected.*** *If two metres, it is too dreadful to contemplate. Half the delta will be lost and three-quarters of the 20 million people will be severely affected," said Le Anh Tuan from the Research Institute for climate change at Can Tho University. "20% of the world's rice crop is grown on the delta so what happens here will have a big impact around the world," he said.*

On the other hand, because hydropower is advertised as "a clean and affordable technology" by the American National Hydropower Association (NHA), **it is also wrongly perceived to be a BIG investment.** Although, this view is changing with the advent of less polluting and financially more attractive alternative technologies, such as: Solar and Wind.

In fact, Hydropower Dams have been found to be cost-ineffective. After 58-years supporting Hydropower dams, Thayer Scudder, the leading authority on the impact of dams concluded that ***"large dams are not worth their cost"*** and that **many dams currently under construction *will have disastrous environmental and socio-economic consequences*** [65] :

> *"The study's authors — three management scholars and a statistician — say planners are systematically biased toward excessive optimism, which* ***dam promoters exploit with deception or blatant corruption****. The study finds that actual dam expenses on average were nearly double pre-building estimates, and several times greater than overruns of other kinds of infrastructure construction, including roads, railroads, bridges and tunnels. On average, dam construction took 8.6 years, 44 percent longer than predicted — so much time, the authors say, that large dams are "ineffective in resolving urgent energy crises."*
>
> *DAMS typically consume large chunks of developing countries' financial resources, as dam planners underestimate the impact of inflation and currency depreciation. Many of the funds that support large dams arrive as* ***loans*** *to the host countries, and* ***must eventually be paid off in hard currency.*** *But most dam revenue comes from electricity sales in local currencies.* ***When local currencies fall against the dollar, as often happens, the burden of those loans grows.***
>
> *One reason this dynamic has been overlooked is that earlier studies evaluated dams' economic performance by considering whether international lenders like the World Bank recovered their loans — and in most cases, they did. But the economic impact on host countries was often debilitating… To underline its point, the study singles out the massive Diamer-Bhasha Dam, now under construction in Pakistan across the Indus River. It is* ***projected to cost $12.7 billion (in 2008 dollars)*** *and finish construction by 2021. But the study suggests that it won't be completed until* ***2027, by which time it could cost $35 billion*** *(again, in 2008 dollars) — a quarter of Pakistan's gross domestic product that year. Using the study's criteria, most of the world's planned mega-dams would be deemed* ***cost-ineffective****."*

Then again, present **variable climatic conditions** are creating unseasonal droughts[66] reducing water volumes in dam reservoirs. Low water levels make dams ***unproductive***, resulting in a ***loss of revenue***.

Climate change is not only affecting the *performance* of Hydropower Dams, but also the *communities* who live both *upstream and downstream* from the dams. A representative of the Vietnamese NGO 'Centre of Social Research and Development '(CSRD) stated[67]:

> *"The reserve of water by the hydropower reservoirs in summer has created critical water shortages for agriculture, aquaculture and daily supply in the lowland areas… She added that the unplanned water release by dams during months with heavy rain has led to flooding.*

As previously discussed for Wetlands, unscheduled **flash floods caused by upstream dams** have already destroyed downstream property, farms, livestock and even killed people in southern Cambodia. **These type of disasters will most likely be repeated often in the future and intensified by Climate Change.** In the tropical area of the Lower Mekong region it is highly probable that during *every* rainy season, *upstream flooding*, will force dam gates to be opened *causing flash floods downstream*. This will put already poor farmers and fishing communities in danger, under stress and further poverty.

The World Bank's own President Jim Kim recently concluded – at the AGM in October 2015 [68] :

> *"We now have to ask ourselves in every infrastructure investment we make: Can we do it in a way that's* ***climate smart****?" If we've learned anything in recent years, it's that the answer for dams is* ***no****.* ***Their viability is already being severely compromised by climate change, from Brazil to Zambia."***

Nice words. But will this translate into **not funding any more Hydropower Dams?** This remains to be seen. Although, *not* according to other representatives of the World Bank at the same AGM meeting who were reported saying: ***"We must continue to fund Dams so we can learn from our mistakes".***

On the basis of all the above information, we can conclude that **Hydropower is not only an** *unethical investment* from a social and environmental perspective, but is also a very *risky investment* [69], [70].

Hydropower Dams are not only damaging rivers, intensifying Climate Change, are an unsustainable development, but are also ***unnecessary***. Particularly, given that there are other better and less damaging options, such as **Solar and Wind technologies.** Poor countries like Laos, Cambodia and Vietnam are better served developing these technologies and getting international funding to do so.

Below we offer a list of the **"cascade effect"** of hydropower dams in the Mekong Basin. Meaning, one factor leads to another and so forth. This is a better term than a 'domino effect' given we are also talking of a cascade of dams.

List of Damages by Hydropower Dams

The damages resulting from Hydropower Dams discussed can be summed up as follows:

- **Dams will block the main stream of the Mekong River and major tributaries.** As a result,
- **Dams will block migratory routes** on the main stream of the river and its tributaries.
- **Dams will also reduce water quality, and reduce vital rich nutrient soils** (alluvium) carried by the river.
- As a result of all the above, **dams will jeopardize the reproductive success of migrating fish species**. Consequently,
- **Dams will reduce the numbers of fish species,** as well ,
- **Dams will reduce fish populations' density**. Therefore,
- **Dams will cause irreparable damage to the fisheries of the Mekong basin,** and
- **Dams will cause a dramatic loss in biodiversity** [71] - though loss of fish species, as consequence of blocking the fish migration routes.
- **Dams will alter the hydrological flow** of the Mekong River and its Tributaries, with dangerous consequences for the whole ecosystem and riverine communities.
- **Dams will create fluctuations in water levels – harmful to riverine communities** both during the dry season and the wet seasons.
- **Water withdrawal for the dams' reservoirs during the *dry season* will endanger aquatic populations**, and will also **harm *upstream riverine communities*** by depleting water volumes necessary for their farms, aquaculture ponds, daily living needs and drinking.
- **Dams will endanger the lives and properties of *downstream riverine communities*** by exposing them to **sudden flash flooding *every rainy season***, as dams are forced to open their gates and release excess water to avoid collapse.
- **Flash flooding by Dams during the wet season will result in loss of homes, livestock, harvests and perhaps even lives** (**yet there is no compensation offered** – as has already occurred in southern Cambodia).
- **Downstream communities *may be exposed to added danger if the Don Sahong Dam collapses as a result of tremors*** – with incalculable disastrous consequences.
- **Dams will ensure damage to the RAMSAR Wetlands in NE Cambodia**, through *extreme drainage* (in the dry season) and *flooding* (in the wet season) –
- **Damage to Wetlands puts at risk the food security, livelihoods and even the lives of thousands of people.** In NE Cambodia, dams will imperil 20,000 people living in the RAMSAR wetlands.
- **Dams will devastate aquatic populations of flora and fauna; and endanger bird populations – both in riverine areas and in Wetlands –** as a result of seasonal excessive flooding and drainage of the Wetlands.
- **Dams will ensure extinction of the Irrawaddy dolphins, the Giant Mekong Catfishes and dozens of other fish species**. As a result,
- **Dams will alter the *balance of the food chain*** and thereby,
- **Dams will alter the whole Mekong ecosystem**.
- **Dams will cause irreparable damage to the Tonle Sap River and the Great Lake** through loss of fisheries, loss of migrating fish species, reduced water quality and loss of alluvium.

- By reducing fisheries and biodiversity, **Dams will reduce the food supply in the Mekong Region.** Therefore,
- **Dams put at risk the Food Security of 60 Million people –** in Thailand, Laos, Cambodia & Vietnam.
- **Dams will** also **jeopardize the livelihoods of millions of poor families in communities** along the Mekong River main stream, as well as, in many tributaries – through the reduction of fish supplies and productive agricultural lands. Therefore,
- **Dams will result in increased poverty**. Consequently,
- **Dams will compromise the health of all riverine communities along the Mekong River and their tributaries**, as well as those along the Tonle Sap and Great Lake (40 Million people) – by the reduction of fish and agricultural food sources.
- **Hydropower Dam projects are built on Human Rights Violations.** In Laos, communities are denied the Right to Freedom of Expression. Any opposition or criticism of such projects is harshly punished (as per Penal Code 46 by Laos), including: jail sentences of 5-15 years with fines, disappearances and killings. Free, Prior and Informed Consent (FPIC) has not taken place or is substandard.
- **Dams have already *displaced* thousands of people, and will displace tens of thousands more,** along the main stream of the Mekong River and its tributaries – to make space for the Dam's reservoirs.
- **Dams have already caused, and will cause further untold suffering to displaced communities now and in the future:** psychologically, physically and emotionally - as a result of being uprooted from their homes, losing their property and livelihood, by being relocated to unknown areas far away from the river and the life they know; and by having to discover a new way to make a living.
- **Dams *only* offer substandard compensation** to ***displaced* communities**, to date.
- **Dams cause loss of water supply for *upstream* communities,** resulting in loss food supply and damage to their livelihood– yet do not offer compensation
- **Dams cause flash flooding**, resulting in loss of property, harvests, livestock, food supply, and the livelihood of *downstream* communities – yet do not offer compensation
- **Dams will ensure the loss of many cultural sites** of importance to local communities and ethnic groups.
- **Dams will cause irreparable damage to the Mekong Delta** – through the loss of fisheries; immense loss of nutrient rich sediments; loss of thousands of hectares of fertile agricultural soils; intrusion of salt water in fertile agricultural lands rendering them unusable; huge reduction in the production of rice, fruits and vegetables; great reduction in income for local farmers, fishermen and government. As a result ,
- **Dams will cause irreparable and massive loss of revenue for Cambodia and Vietnam calculated in Billions of Dollars** – through the huge loss of exports.
- **Millions of tons of Green House Gases (Methane and CO2) emissions will be continuously produced by Dams** – through the decomposition of organic material in the reservoirs; as well as, the continuous emissions exacerbated by dams and resulting from drying and flooding of wetlands and riverine areas, during the dry and wet seasons.
- Consequently, **Hydropower Dams in the Mekong will intensify Climate Warming.**

In light of the above, the notion that Hydropower Dams in the Mekong Basin are sustainable, ethical, socially and economically beneficial is *indefensible*.

Beneficiaries of Hydropower Dams in SE Asia

The main beneficiaries of Hydropower development in SE Asia are definitely the Chinese Banks and Corporations, as most electricity produced by any dams on the Mekong will be sold to China. Other Banks and mostly Asian Developers also profit through opening roads and all other infrastructure needed for electricity networks (see list below). This infrastructure may also be used for other types of development such as mining. Other beneficiaries are illegal loggers and poachers of fauna who now operate and have access to remote areas as a result of new roads.

It is important to inform the public that **Hydropower development in SE Asia is promoted and financed in large part by Chinese Banks and Corporations, in China's bid for power and sovereignty in the region**, as stated below [72]*:*

> *"Large dams have been controversially debated for several decades due to their large-scale and often irreversible social and environmental impacts (WCD, 2000). In the pursuit of low carbon energy and climate change mitigation, hydropower is experiencing a new renaissance in many parts of the world, despite its vulnerability to climate change and increased water stress (IPCC, 2011).*
>
> *At the forefront of this renaissance are the* ***Chinese, the world's largest dam builder****.* ***Sinohydro****, a Chinese state-owned enterprise (SOE), is* ***leading the global hydropower sector in terms of number and size of dams built, investment sums and global coverage****.*
>
> *While China has a long history of domestic dam-building, recent developments have led to rising numbers of Chinese overseas hydropower dams, particularly in low and middle income countries in Asia and Africa (Bosshard, 2009; McDonald et al, 2009; International Rivers, 2012).* ***Power generation equipment is now China's second largest export earner after electrical appliances*** *(Bosshard, 2009).*
>
> ***Other motives include China's search for overseas job creation for Chinese workers and for providing the infrastructure for larger resource extraction projects*** *(Bosshard, 2009), for example, in planned aluminum industries at the Bakun dam site in Borneo, Malaysia. Chinese dam-builders differ from other dam builders due to their bundling of aid, trade and investments; the role of state-owned enterprises (SOEs) that are backed by abundant state funding; their own distinctive way of handling (and not seldom, disregarding) social and environmental impacts; their pragmatic approach to regional politics and political alliances and their need for access to natural resources.*
>
> ***The Mekong River and its tributaries have become a major development site for China's dam-builders in recent years****. China's neighbouring countries Laos and Myanmar aim to export electricity from the Chinese dams back to China. Laos has even named itself the "battery of Asia" and aims to export a large share of its electricity to neighbouring countries like China and Thailand, rather than using it domestically."*

The issue of China's investment on Hydropower in the Mekong has been examined and clarified by the CGIAR Research Program on Water, Land & Ecoystems [73]. An excerpt of their paper is given below as it raises some very interesting yet problematic issues:

> *"China's ability to meet energy demands domestically is further threatened by the agricultural and industrial sectors' massive water and energy demands [20]. The energy intensive economy has also propelled* ***China to become the world's leading carbon emitter****, which increasingly places pressure on China's administration to play a more leading role in climate change goals as an emergent superpower within the context of global geopolitics.*
>
> ***Environmental policies and pollutant regulation may be viewed as an obstacle and a nuisance to development in China.*** *This is especially true at the local levels where officials are valued and promoted primarily based on GDP increases. Renewable energy, however, is a priority pillar industry for the government's national development plan [21]. Renewable energy and especially hydropower is seen by Chinese scholars and the government not as an impediment to development, but as a solution to the challenges it faces across the nexus and is the dominant goal of energy security [21]. In addition, renewable energy is perceived as an important sector for China's economic expansion, trade, and technological enhancement [22].*

While there have been massive investments into all three main sources of renewable energy in China (hydropower, wind and solar), many of the investments are geared towards GDP increases *at the local and corporate levels, and lack the planning and collaboration necessary to contribute effectively to the country's macro-economic targets. Despite China being the world's largest investor in wind and solar power, 23% of the turbines and 28% of the panels* ***are not connected to the grid****, and therefore do not actually contribute to national power production [23]. If around a quarter of the billions of dollars of renewable energy projects are not actually contributing energy to the grid, it may be argued that these industries are not being driven by environmental policy alone. Although policy might be aimed at energy security, the investment does not necessarily contribute to the expected energy goals, an argument that this article will return to with regards to the Mekong Basin.*

China has been unable to shift its economy to less energy intensive production higher up the value chain, which will make it increasingly difficult for renewable energy targets to be met. The renewable energy sector only contributed to around 1% of China's total energy consumption (not including hydropower) in 2010. Renewable energy is projected to contribute 15% of the energy supply by 2020 (See Table 1). Although there has been large investment in the solar and wind sectors, China's inability to shift the economy to less energy intensive production means that wind and solar energy will contribute only minimally to the overall energy supply. The vast majority of renewable energy supply that is needed to meet ***China's energy targets will come from hydropower production****. The majority of which exists in the west and southwest of China on transboundary rivers.*

Chinese SOEs' hydropower investments and activities are part of an increasing trend for both individual state and private sector led infrastructure financing and development that is expected to reach as much as ***four trillion dollars*** *by 2017 [66,67,68]. The Asian Infrastructure and Investment Bank and the Silk Road Fund, for example, will soon bring an additional $140 billion dollars of investment for development, a large proportion of which will be aimed at hydropower."…*

"We conclude that although policies from China recognize interconnections across the nexus, political and economic forces craft narratives that downplay or disregard these nexus interconnections and trade-offs. This in turn, influences how trade-offs and interconnections in hydropower development are managed and recognized in both local and transboundary contexts, thereby, ***creating*** *potentially* ***significant negative impacts on livelihoods, food security and the environment****."*

Shareholders of Banks & Corporations involved in Hydropower development worldwide must be aware of the ***unethically earned profits their investments support***. Shareholders of the following Banks & Corporations involved in Hydropower development in SE Asia are encouraged to reconsider and perhaps withdraw their investments – for the welfare of 60 Million people, the Irrawaddy Dolphins, the Mekong River Ecosystem, and to reduce Climate Change:

- **Big Banks:** Asian Development Bank; The Chinese Banks: China Export Import (ExIm) Bank, ICBC, China Development Bank; the new China-led 'Asian Infrastructure and Investment Bank' (AIIB); the Silk Road Fund**;** and the World Bank Group.
- **Big Corporations:** Sinohydro International, Hydrolancang International Energy; Ch. Karnchang; Mega-First Corporation Berhad; EVN International Joint Stock Company; Royal Group, among others.

Shareholders also need to know that there is a growing movement to remove dangerous, damaging dams and to try to restore what little fisheries are left in rivers across the world. **In the USA alone, over 1,150 dams have been decommissioned or torn down**[74] - and yet other dams are still being pushed…

Shareholders are strongly advised to invest in Climate-friendly Solar and Wind technologies. Such renewable energy projects are much more interesting and productive investments. According to the International Energy Agency (EIA), figures show there is a clear sign of transition in energy production. **In 2014, renewable energy made up half the world's new power plants** [75]**.**

Conclusions

In summary: Hydropower Dams are a risky investment, cost-ineffective, loose revenue during the dry season, emit large amounts of Green House Gases, intensify Climate Change, are built on human rights violations, do not necessarily give poor communities electricity, increase poverty and despair, result in the displacement of tens of thousands of people from their homes, destroy river ecosystems, and put the host countries' economies in deficit by having to repay exponentially increased debts to big banks years after completion …

As for the Ecological Damage to the Mekong River itself: Hydropower Dams will block the main stream of the Mekong River; will block vital fish migration channel and main stream; will reduce fisheries and biodiversity; will reduce the food supply and therefore risk the Food Security of 60 Million people, driving them into further poverty; will guarantee the extinction of the beautiful Irrawaddy Dolphins and hundreds of fish species, including the rare Giant Mekong Catfish; will alter and damage the Mekong River ecosystem; will damage important carbon sinks such as the wetlands; will cause the loss of thousands of hectares of very productive soils in the Mekong Delta and increase salt intrusion; will result in massive economic losses to Cambodia and Vietnam; and will intensify Climate Change…

This picture is certainly quite different to the sales pitch that Big Banks and governments are giving the public. Compared to the costs associated with the above damages, the financial benefits offered by hydropower dams to host countries are actually minimal and not worthy. **In fact, the one thing dams are good for is to make the Big Banks that finance them and the developers extremely RICH!**

Of serious concern, is that important organizations such as the *International Water Association (IWA),* who steers the future of Water Resources management worldwide, is so *ill informed* about the impacts of Hydropower Dams. Or, worse still, could it be that IWA is in collusion with the Big Banks and Hydropower developers?

Below is a clear example of unhelpful recommendations by no less than *IWA's Executive Director Ger Bergkamp* [76] :

> *"Reducing energy consumption along the water value chain and* ***producing energy from water supplies*** *and waste water* ***can make a significant contribution to mitigating climate change****.*
>
> *Reducing energy demand,* ***diminishing carbon emissions and recovering precious resources*** *all contribute to lower energy costs for utilities and consumers alike."*

The highlighted two statements above are in contradiction*.* ***The executive Director of IWA ought to be better informed:*** producing energy from water supplies *does not make a significant contribution to mitigating climate change*. As previously discussed, Hydropower reservoirs emit vast amounts of GHG: with dams producing 23% of Methane per year of world emissions. Hence, **Hydropower actually INTENSIFIES Climate Change**. And **rather than *recovering precious resources,* hydropower actually *destroys them***!

Big Banks and developer consortiums, however, *are fully aware of the the damning evidence*. Yet, they continue to push countries in Asia, Africa and Latin America to build new, big dams while ignoring the now well known social, economic and ecological costs to the host countries.

To risk the viability of a multi-billion dollar producing ecosystem like the Mekong River [77] **and risk the livelihoods of over 60 Million people for capital gain, is highly irresponsible and verges on a criminal act, tantamount to ECOCIDE.** Particularly, given there are so many gaps in fisheries data, as well as, gaps between policy, practices and on-ground reality.

It is incomprehensible and unacceptable that so much misery and such major losses will ensue, only so that Big Banks and Corporations can make BILLIONS of dollars in profits.

COP21 representatives must be made aware of this falsehood. They must be informed about the devastating impacts Hydropower dams have socially, economically and ecologically, and in particular on Climate Change.

Hydropower interest groups (Big Banks, Developers, Corporations), joined by poor countries such as Laos, will be at COP21 meetings in Paris. They will be unashamedly promoting Hydropower Dams, *as an important tool for Sustainability, Reduction of Poverty and Reduction of Gas Emissions to alleviate Climate Change*.

They will also be lobbying for a **Global Carbon Market** in which rich countries are allowed to **offset their emissions against Clean Energy,** i.e. against Hydropower's supposedly 'Clean energy'... (This means more 'big business' for Hydropower interest groups.)

If such a decision was made on behalf of Hydropower dams, **it would justify a Chinese-led frenzy of Hydropower Dams construction around the world,** with disastrous consequences for Climate Change and Water Resources worldwide.

A Global Carbon Market endorsement of Hydropower will give *Carte Blanche* to Brazil, Peru, Ecuador, Venezuela, Colombia, Bolivia and the Guianas to build hundreds of dams in the **Amazon** basin, with the **ensuing massive deforestation** necessary to build the Dams' reservoirs. **The resulting impact on Water Ecosystems, Forests and Climate Change would be staggering and irreversible!**

An endorsement of Hydropower would also encourage Laos to build another 70 dams, and other nations to build thousands of others. As it is, the planet's rivers are already suffering enormously from over 40,000 dams[78] already built, from water pollution and climate change.

Any more dams will tip the balance against our most precious resources: WATER and AIR!

Any dams built on a large scale will also entail the displacement of hundreds of millions of people worldwide, creating a disastrous humanitarian crisis. To date nearly 100 million people have already been displaced for the construction of Dams, mostly in China and India.

Building new hydropower dams is totally unnecessary. This is particularly true given that there are other better and less damaging options, such as **Solar** and **Wind** technologies. Poor countries like Laos, Cambodia and Vietnam are better served developing these technologies and getting international funding to do so.

Unless COP21 representatives, NATO and the United Nations intervene now, the result of such unsustainable Hydropower Development projects will be disastrous not only for SE Asia, but for the Water Resources and Climate. RIP Mekong?

Recommendations

1. Compliance to IHA's Best Practice Criteria

The construction of all Hydropower Dams in the Mekong basin must be halted on the grounds that they do not conform with and breach most of the *Basic Best Practice Criteria* established by the International Hydropower Association.

Compliance to the Principle of "No Harm" must be guaranteed prior to any further Dam constructions for: downstream communities, the Tonle Sap lake, the Mekong Delta, the Mekong Fisheries, and the productivity and health of the Mekong Ecosystem as a whole.

This entails **postponing all projects** until the following information is compiled:

1. The comprehensive Environmental Impact Assessment Study commissioned by Vietnam is made public in December 2015.
2. Further long-term Fisheries Studies are undertaken to gather data on:
    - The most common and abundant fish species that migrate up and down the Mekong River
    - Fish migration patterns
    - Attributes of preferred migration channels or streams
    - Location of main spawning grounds, particularly for the most threatened species and the most commercial species
3. Realistic on-ground mitigation measures are fully studied and tried.

2. Compliance to Human Rights and FPIC

We ask the **UN Special Rapporteur on Human Rights and the Environment** to investigate and act on the **Human Rights Violations linked to Hydropower Dams in the Mekong Basin**. The governments of Laos, Cambodia, Thailand and Myanmar, ought to be admonished and put on notice by the UN Human Rights Commission, for violations such as:

- Trans-boundary environmental impacts, especially in the context of Hydropower mega-projects and major foreign investments
- Lack of Free, Prior and Informed Consent (FPIC) or substandard community consultation process
- Dams, inundation and loss of property by reservoirs, and relocation – being *forced* upon communities:
    - Without their full knowledge of the implications, i.e. benefits and damages caused by Dams
    - Without their consent – for free of repression and intimidation
    - Despite their opposition
- Fear-based laws preventing Freedom of Expression, i.e. Laotian Penal Code 46
- Fear-based laws resulting in jailing, killing or disappearance of activists or journalists opposing Hydropower Dams or other environmental issues
- Loss of Food Security, property and income.
- Lack of or substandard compensation to affected communities by Dams
- Lack of compensation for property damage and loss of lives to *downstream* communities that have been flooded by unscheduled water releases by upstream dams.

On these grounds alone, **all construction of Hydropower Dams ought to be HALTED** in the Mekong Basin and each individual case heard, while ensuring both the affected communities' full information and participation, as well as ensuring their *protection* from reprisals by the governments in question.

3. Encourage Vietnam and Cambodia to Submit a 'Prima Facie' Case

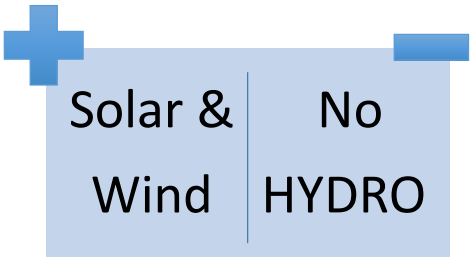
The Hydropower Dams being built in Laos (the Xayaburi Dam and the Don Sahong Dam) and their impacts both on local and trans-boundary communities, effectively constitute a *prima facie violation* of international Law.

As such, **it is recommended that the governments of Vietnam and Cambodia are perfectly entitled to submit this matter to the International Court of Justice in The Hague.** The sooner, the better. *Once the damage is done it will be irreversible!*

4. Encourage Countries to Invest in Renewable Energy Technologies

Building new hydropower dams is totally unnecessary. This is particularly true given that there are other better and less damaging options, such as Solar and Wind technologies**.**

Wind and Solar renewable energy projects seem to be better investments and Climate friendly. According to the International Energy Agency (EIA), figures show there is a clear sign of transition in energy production. In 2014, renewable energy made up half the world's new power plants.



it is recommended that the governments of Laos, Cambodia, Vietnam, Myanmar and Thailand STOP any further Hydropower development in SE Asia. Instead, it is suggested that these countries **focus on developing Solar and Wind technologies.** And, that they seek international funding and technical support to do so.

5. Encourage COP21 to Place a Ban on Large Hydropower Dams for Climate Protection

We recommend that governments at COP21 meetings in Paris address the issue of Tropical Hydropower Dams as big polluters, which intensify Climate Change. And, that a Global Carbon Market in which rich countries are allowed to offset their emissions against Clean Energy, ***does NOT include Hydropower.***

We recommend discouraging and banning all further *large* Hydropower developments, particularly in the Amazon basin, in Africa and in the Mekong River. *Any more dams will tip the balance against our most precious resources: WATER & AIR!*

Any dams built on a large scale will also entail the displacement of hundreds of millions of people worldwide, creating a *disastrous humanitarian crisis*. To date nearly 100 million people, have already been displaced for the construction of Dams, mostly in China and India.

The viability of water ecosystems on which billions of people worldwide depend upon for survival must to be placed as a priority, over profits for Big Banks and Corporations.

Humanity has allowed many *Ecocides* in the past. Most people have turned the blind eye, while others sit on the fence watching. We hope this will not happen at COP21 and that governments will realize **the importance of protecting Water Ecosystems and the Climate for humanity's survival**.

To end on a sensible note [79] :

> *"Water is the primary medium through which climate change impacts humans, society and the environment. Water resources management that builds on ecosystem-based approaches is essential for securing resilience and a key component in disaster risk reduction. Water is also critical for successful climate change mitigation, as many efforts to reduce carbon emissions depend on reliable access to water resources…*
>
> *Water wise strategies supporting resilience and disaster risk reduction are fundamental for the provision of safe water, livelihoods and sustainable energy sources. Supporting the sustenance, preservation and restoration of healthy ecosystems will increase resilience to water related disasters. Including key water resources management functions in adaptation planning processes will help in coping with both increasing climate variability and long-term shifts in climate conditions."*

Quotes

"Clean Waters and Productive Water Ecosystems - are the RIGHT of every Human, Animal and Plant on Earth". – Dr. Lilliana Corredor, Environmental Educator, Founder of Scientists for the Mekong

"The protection of the environment is likewise a vital part of contemporary human rights doctrine, for it is a sine quo non for numerous human rights such as the right to health and the right to life itself. It is scarcely necessary to elaborate on this, as damage to the environment can impair and undermine all the human rights spoken of in the Universal Declaration and other human rights instruments." – Judge C.G. Weeramantry, former vice-president of the International Court of Justice.

"As pressure on natural resources increases, land and environment rights defenders have become among the most vulnerable groups in terms of killing. These defenders…must be protected. They must be empowered because they are not only fighting for their lives but also for ours." – Antoine Bernard, CEO of the International Federation for Human Rights (FIDH)

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ACTIONS You Can Take

- **Sign** our Petition to **STOP Hydropower dams in the Mekong**
  https://secure.avaaz.org/en/petition/Mr_Viraponh_Viravong_Deputy_Minister_of_Energy_and_Mines_Lao_PDR_We_call_on_you_to_SAVE_the_MEKONG_River_DOLPHINS_Suspen/?nQAhpab

- **Sign** the Petition by International Rivers: **10 Reasons Why Climate Initiatives Should Not Include Large Hydro**[80]
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