

DEMOGRAPHIC AND ECONOMIC CONSEQUENCES OF AGENT ORANGE SPRAYING

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Examination of long-term effects produced by the spraying of defoliants (among which is the Agent Orange) during the American war must take into account the question's demographic and economic aspects. Let's recall that the spraying aimed at two purposes: annihilating vegetation to deprive the Viet Cong of their protection and camouflage¹; and destruction of crops and environment (hunting and gathering) to prevent villagers from accommodating and feeding the Viet Cong.

Spraying was massive and systematic: total destruction of targeted areas (forests, mangrove swamps, land under cultivation, and river-banks) sparing no hamlets (and their inhabitants), repeated spraying (two, three, even more times). The strategy of destruction has a lot of means at its disposal: classic bombings, bulldozers, napalm, phosphoric bombs, etc...

The spraying aimed not so much at localized defoliations as lasting effects on the whole of affected spots: not only inhabitants, but also physical environment (soil and water) and every form of animal and plant life (forests, mangrove swamps, savannahs, crops).

But public health and environmental aspects of spraying have held the attention of researchers as much as demographic and environmental ones. Research we carry out is not easy, particularly on account of the tragic absence of documented and checked data.

So this paper is aimed above all to constitute a contribution to the collective reflection. It bases itself on existing data and tries to raise some important questions for Vietnam's development and future, which it is impossible to find immediate answers to, but which would form the subject of prospective studies.

From this viewpoint, we will first examine one of the main problems immediately confronting us when we broach the subject of Agent Orange: what is an Agent Orange victim? Then we will try to bring forward some elements relating to the dynamic of

¹ The roundup of people in "strategic hamlets" (an operation got under way in 1964) probably related to spraying.

population. Afterwards, we will contemplate the economic dimension of the question, at least what regards some of its facets. Finally, we will particularly examine the case of the rural society.

What is an Agent Orange victim?

Difficulties of definition and assessment

On the whole, there are no accurate data regarding handicaps among the Vietnamese population, notably in each province². Problems of assessment in this field are complex and, in Vietnam as well as in other poor countries, data on handicaps are partial and relatively reliable³.

So it is quite difficult to give the number of victims since we not easily define a victim because we lack epidemiological investigations⁴. In fact, it is difficult, 40 years after the facts, to find definite medical “pieces of evidence” allowing to determine whether a handicap is due to dioxin or another cause. Even among the consequences connected to the American war, specific effects of defoliants containing dioxin are difficult to isolate from those produced by other weapons utilized (napalm, bombings, gas, etc...) For example, how to tell the effects of the Agent Orange from those produced by other defoliants utilized (Agents Blue, White...) Apart from their effects on the population (and also on the flora and fauna), we must notice that the combined effects of those chemicals are in all probability more noxious than those of each of them taken separately. And with time, other sources of contamination by dioxin can emerge, notably important quantities of pesticides utilized in agriculture, that come from the same chemical plants producing defoliants utilized during the war.

Let’s note that these difficulties are scientifically and politically important, including in terms of responsibilities, but that they may appear secondary, as a victim is above all a person who needs help, whatever the origin of his handicap may be.

Some kinds of evidence?

In relation to all these questions, we set out three comments. First of all, we must distinguish between the individual evidence telling that such a person is a victim or not of Agent Orange, and the statistical proof if we can show that we find in Vietnam specificities for some pathologies in comparison with countries where modes of life are

² “Not only is it important to have estimates of the overall prevalence of various disabilities, but, perhaps more importantly, it is important to know the geographic distribution of persons with disabilities and the type and location of rehabilitation centers and staff for the disabled” (Kane, 1999, p. 1)

³ The quality of reported data varies widely, and a fair amount of data are missing. Over-reporting or under-reporting of specific kinds of disability occurs due to problems in the definitions of disability or staff being inadequately trained in proper methods of collecting disability data in surveys, CBR reporting, or at rehabilitation centers” (Kane, 1999, p. x).

⁴ The Vietnamese government estimates at one million people actually suffering from affections linked to their exposure to Agent Orange.

comparable. For instance, a larger proportion (in comparison with the population or with the number of births) of miscarriages, type 2 diabetes, malformed babies, etc. This “statistical proof” could be produced by epidemiological investigations targeted on those pathologies.

Afterwards, individual evidence may be medical proof if we conduct a chemical analysis of fat or milk allowing to bring to the fore high rates of dioxin. But we know that such analyses cost a lot and cannot be implemented on large groups of specimens. In fact, to prove the exposure many years after the event, and to prove the link between exposure and pathology is a difficult and sometimes very expensive job. And Vietnam, despite the quick economic development in the course of fifteen last years, remains a poor country where funds are allocated as a priority for health care and assistance rather than for the search for evidence.

At last, without mentioning this individual evidence, we doubtlessly may make a presumption with regard to second or third-generation descendants through genealogical researches like those conducted by CGFED⁵. But we then must carefully select the specimens to distinguish families, of which some members have “met” Agent Orange (a combatant parent or grand-parent who was present in areas where defoliation was targeted, or who just inhabited there by the time of defoliation; or else who has migrated in areas acknowledged as being still impregnated with dioxin), from families that we may consider as having never been in touch with defoliants utilized during the war.

Different possible types of victims

Preceding reflections bring us to contemplate many possible types of victims, and this typology can help clarify the discussions. It seems that we may consider at least four categories of populations:

- a) people and soldiers who were present by the time in areas where defoliation was targeted and who are “potential victims”: they may have or have not developed pathologies that can be linked to Agent Orange;
- b) among them, those who have been affected by defoliants, whether directly (their bodies were hit by defoliation), or indirectly (they have lived for a certain time in areas affected by defoliation, fed themselves⁶, drunk water, had a swim, etc...) and who have contracted an affection (and who whether still are alive, or whether they already are dead); those people can be found anywhere in Vietnam as a result of migrations; those are “immediate victims” (of the first generation);

⁵ Center for Gender, Family and Environment in Development, Hanoi.

⁶ The most common contamination comes from the consumption of fish or animals which have ingested dioxin accumulated in adipose tissues.

- c) their children (and grandchildren) possibly affected directly (through the placenta, through breast-feeding, even through genetic mutations) or indirectly (because they have eaten contaminated food or have had played in polluted lakes, etc...); those are victims of the second or third generation;
- d) people who, by migration, settled themselves in contaminated areas, and their children and grandchildren, that have developed some affections connected to dioxin; those are victims by migration.

Agent Orange and dynamic of population

Our knowledge of Vietnamese demography permits to be more specific about two points in order to shed light on this typology and call in mind afterwards a third question.

Survivors, 35 or 40 years after defoliation

The utilization of data provided by Stellman (Stellman et al., 2003) and the dynamic of population of Vietnam (see chiefly the results of the 1999 population census) leads to following orders of importance. We mean orders of importance because data are hardly accurate.

Defoliations, that were conducted from 1961 to 1971, were concentrated on the period of 1966-1969. The average of this distribution is set approximately on 1 January 1968.

By this time, Southern Vietnam had about 38 million inhabitants.

Survivors from this population on 1 January 2005 are now 37 years old and more.

People of 37 years old or more represent, according to the population census of 1999, about 27,5% of the total population.

Now we may consider that the population living on 1 January 2005 within the former South Vietnam is about 44,4 million inhabitants.

Among this population, people of 37 years old or more are about 12,2 million inhabitants.

Stellman shows us that 4611 villages have been struck by defoliants. There is a population estimate for 3181 villages out of these villages, that is to say a total of 2,1 to 4,8 million inhabitants. If we suppose that the remaining 1430 villages had an average population identical to that of other villages, the total population directly struck by defoliation was between 3 and 7 million inhabitants, that is to say, in adding this number to 38 million inhabitants of South Vietnam at that time, between 8 and 18% of the population. Let's note that it is a minimal estimate because we don't take into account other means of spraying defoliants (trucks, ships, by hand) that were near dwelling places.

By applying these proportions to the population of 12,2 million inhabitants, we find that the number of people hit at the time by spraying and who are still alive is between 1 and 1,2 million.

Such is the estimate that can be given of “potential victims”. But it is only an order of importance, since the calculation, applied to the present-day population, takes into account immigrants. It doesn’t take notice of emigrants, fighters from the North that were present in the South at the time, all those who resided in the neighbourhood of American camps where were stocked a great many chemicals and who can be directly or indirectly contaminated by the utilization of storage barrels (reused to lay in stores other things, including foodstuffs or drinking and bathing water); moreover, a deathrate was doubtless higher among these potential victims than the rest of the population.

The role of population movements

Vietnam has experienced a long history of migrations, that can be traced back to the Southwards Movement (Nam tien) In recent years, Vietnam has seen “organized migrations” meant to redistribute the population on the territory by force of circumstance (in particular owing to high population densities observed in the Red River delta). These organized migrations have concerned practically all provinces, known as emigration provinces or immigration provinces (Gendreau et al., 2000).

Since the risks linked to defoliation were not observed, and regions still polluted by defoliants had not be identified yet, it is probable that some provinces particularly damaged by defoliation can be provinces of emigration, which has furthered the dispersion of people affected in all the territory, or conversely, provinces of immigration, which can contaminate people initially healthy but who settled themselves later in polluted environments.

We have been able to analyze data per province on organized migrations over the period of 1976-1998⁷. Results of the analysis show that the above-evoked possibilities have effectively materialized in many cases. So, without going into details, if we characterize the provinces by the proportion of their surface having been damaged by defoliants in relation to their total area:

- The three provinces most affected by defoliation (more than 37% of the damaged area) are listed among the provinces having accommodated the most immigrants; those are the provinces of Dong Nai, Song Be (now Binh Duong and Binh Phuoc) and Tay Ninh. situated in the of South-East of Vietnam;
- the following five provinces, much affected by defoliants (over 17% of the surface damaged), are those which have sent the most emigrants to other provinces; those

⁷ Data provided by the Department of Population redistribution and New economic zones (Ministry of Agriculture and Rural development).

are southeastern Ho Chi Minh-City, Quang Nam-Da Nang (Da Nang and Quang Nam today) and Nghia Binh (Quang Ngai and Binh Dinh today), situated on the central littoral, Binh Tri Thien (Quang Binh, Quang Tri and Thua Thien-Hue today) situated in the Centre-North, and Ben Tre, situated in Mekong delta;

- we may also cite the case of Dac Lac, province on Central Highlands, scarcely damaged by defoliants (4% of the surface affected), but which accommodates a lot of immigrants, especially from Binh Tri Thien and Quang Nam-Da Nang.

Through these examples, we understand well that victims of Agent Orange are found again everywhere in the country, not merely in the Centre and the South, and that people who have not yet been contaminated by dioxin can be by migration.

Vietnamese communities living abroad

Finally, a last point deserves to be considered. Since the end of the war, and until the middle of the 1990s, a great many Vietnamese from the South emigrated, either illegally (the “boat people”) or in the framework of a programme set up in 1979 (Barbieri). Those populations can have been potentially exposed to Agent Orange. Yet there has not been any particular treatment of them, nor any specific research regarding them. Nevertheless, 1,4 million people have emigrated.

In particular, these emigrants have gone to the United States (over 800.000 people). Have they made themselves heard, especially in relation with American veteran? We don't know. Does this population present a particular pathological situation? In fact, it appears difficult to think that the emigrants have not been, at least as much as American veterans and the Vietnamese staying there, damaged by that exposure.

Likewise, many countries have accommodated a lot of those emigrants: Canada (160.000), Australia (160.000), France (50.000), etc...But we have not found in scientific literature any article dealing with the effects of Agent Orange in these overseas Vietnamese.

The burden of Agent Orange borne by Vietnam

Difficulties of estimation

For all the reasons called up previously, it is extremely difficult to estimate the burden of Agent Orange borne by Vietnam.

The costs belong to two orders: human cost and environmental cost. These costs are both direct (deaths linked to exposure, destruction of the flora and fauna, health spending and expenditure involved in cleaning contaminated areas) and indirect (costs entailed by the analyses necessary to producing evidence of the connection between exposure to Agent Orange and the pathologies developed, to know the dioxin content in the soil and animal products, as well as the cost of administering the aid offered to

victims by the Vietnamese government and by households), and the cost of opportunity (loss of income for families and the country, connected to handicaps and pathologies caused by Agent Orange and by defoliation that has made thousands of hectares unsuitable for farming and potentially threatens the export of Vietnamese processed foodstuffs).

If the noxious effect of dioxin on man is not challenged, the number of people affected, the effects in time, the nature and scale of contamination according to exposure would remain subjects much discussed. It is frustrating to notice that science hardly gives clear answers to the many questions being asked. On the subject of the assistance provided for Vietnam war veterans, the American government has settled the question by listing, on the one hand, the pathologies that the Academy of Sciences of the United States acknowledges as being directly associated by exposure to dioxin, and by determining, on the other, that this help should be accessible to all Vietnam veterans, independent of the evidence produced on the link between treated affections and exposure⁸. Although it has protected itself by a law that anticipates any possibility to start legal proceedings against the State for a loss sustained in the service of the State, the American government explicitly acknowledges its responsibility in assistance to be provided for veterans. In those conditions, the American government's position vis-a-vis diseases of veterans can constitute a basis of reasoning to evaluate the loss sustained by the Vietnamese, whether or not they are fighters, or more often mere civilians in combat zones.

Three distinct questions being linked together are put on economic costs: compensation for the loss sustained until now by Vietnam, and for costs of opportunity; financing of the assistance; and financing of analyses necessary to the evaluation of the contamination of the soil, the flora and fauna, as well as the money put up for the decontamination of soils. We won't venture here to evaluate these costs.

Thus, the estimation of costs associated with deaths depends on many factors. The estimation of the cost of a Vietnamese life of 60 years can only give a very small number, and the war situation implies a slight hope of survival (both because of the risks directly connected to the fighting and the hygienic and health conditions prevailing in the zone). It is evident that in the course of following generations, the level of education was higher, hygienic and health conditions were better, death-rates were lower, bringing about an increase of life value measured in monetary terms. Yet these new generations have not been directly affected by the spraying of Agent Orange during

⁸ "Under current law, the Department of Veterans Affairs (VA) provides medical treatment to veterans for disabilities associated with exposure to Agent orange and ionizing radiation. VA treats these veterans for certain diseases whether or not sufficient evidence connects the conditions to the exposure. This bill would extend VA's authority to provide medical treatment to veterans exposed to Agent orange through December 1997, but would limit treatment to conditions the National Academy of Sciences has deemed positively or suggestively associated with exposure, or for which there is not enough evidence to permit a conclusion. Diseases for which limited or suggestive evidence shows no association would not be treated unless credible evidence of suggestive association is found" (Congressional Budget Office, 1995, p.2 basis of estimate).

the war. In order that they could be involved in the category of people entitled to compensation, evidence must be found of the causality between defoliation during the war and the deaths/pathologies observed.

Consequences on economic life of families

Economic and social impacts on damaged families is immeasurable (in literal and figurative sense), not to speak of individual problems (psychological and physical). Immediate effects on the life of damaged populations regard in the first place the loss of their means of production. Small farming exploitations that were affected by defoliation were reduced to poverty (some specific products of the spray prevent the maturation of crops when they are not destroyed). The workforce is affected, even if it is impossible to make clear statistically the handicaps and their impact. Healthy adults in a family have to devote part of their time caring for handicapped family members. Providing schooling for sick children is difficult. Incomes of families are reduced, and the cost of medical care aggravates their situation.

A survey (carried out by Gibb, 1999) evaluated at about 60% the proportion of farming households compelled to live in poverty/ or to live in refugee camps.

An investigation conducted in 2001 in Quang Tri province (next to the 17th parallel, an area particularly damaged) has shown that the income per person of families having at least one handicapped member is much less than that of families that are not damaged, and that health spending per person is much higher (Palmer, 2005).

It is then necessary to set up procedures furthering the integration of victims into the economic and social life, and giving them the means to meet their basic needs. For example, we can provide them with a vocational training. Or we can help them to increase incomes in families, for instance, by supplying them with farm animals (fish-farms, cows, cow-buffaloes).

As far as assistance is concerned, it is logical to consider that damaged populations have a right equivalent to that of American veterans to get access to health care and to the assistance they need. The US government has at least a moral obligation in this field, and we hardly see how criteria different from those enjoyed by American veterans can be applied to the Vietnamese.

Macro-economic consequences

Macro-economic effects (at regional and national level) are multiple: activities of health services devoted to victims, loss of the creation of wealth (between 500.000 and 1.000.000 adults are to some extent handicapped by dioxin, which inevitably has a knock-on effect on the GDP) etc... We will examine here two aspects of these consequences: budgets devoted to the help of victims, and the question of exports.

The Vietnamese authorities are active in the face of providing help for victims. The government provides some victims with allocations ranging from 5 to 10 euros per month (apart from the assistance which can be provided by provinces and districts) (Palmer, 2005). Those are people (ex-servicemen or civilians) who were exposed to Agent Orange and/or their children, who suffer from handicaps preventing them, totally or partially, from working. It is insignificant, even when taking into account the average living standard in Vietnam (530 euros per inhabitant and per annum), that is to say 0,5% of public expenditure).

With regard to exportations, the problem of innocuousness of Vietnamese products (shrimps, fish, etc...) is raised. Regardless of the real effect, the impact on the export of processed foodstuffs is potentially devastating. On the whole, plants do not absorb dioxin, but it was rumoured in 2001 that Vietnamese coffee can be contaminated with dioxin, as a result of the falling prices of coffee which was attributed by some to the massive growth of Vietnamese exports.

The export of farm and aquatic products represented in the early 2000s nearly 5 billion dollars, that is to say 13% of the GDP (GSO, 2005). Vietnamese exports in 2002 were made up of 14% for farm products and 12% for aquatic products. Exports, in relative terms, of farm products tend to decrease, while exports of aquatic products tend to increase. For farm products, the majority of exports is fulfilled, besides rice, in such crops as coffee, cocoa, rubber, etc. Aquatic products are partly freshwater ones such as the well-known catfish, but most are made up of sea products..So there is limited risk of dioxin exposure for consumers abroad. However, suspicion could taint the credibility of all products from Vietnam. To anticipate the panic internationally would require information campaigns that are backed up by indisputable scientific results, meanwhile, Vietnam is faced with strong budget constraints.

With regard to fish and shrimps, the Vietnamese government, in the early years 2000, worried about that dioxin levels in some areas of Vietnam would constitute a prejudice against Vietnam's exports. American catfish farmers were claiming that Vietnamese food exports – particularly catfish – were contaminated with dioxin stemming from Agent Orange. However, research carried out in 2001 by the University of Texas – Dallas, School of Public Health, on twenty two food specimens exported to the United States and Laos (mainly fish) revealed minimal dioxin rates. According to its conclusion, it was improbable that Vietnamese food exports were strongly contaminated with dioxin from Agent Orange or from other sources (Schechter et al., 2003).

Consequences of the spray on rural life.

Finally, let's remember that the Vietnamese population is still essentially rural (77% of the total population), and that this population has particularly been affected by the spray.

Overall view

Ecological consequences must be differentiated according to circumstances in time. Lasting deforestation, surfaces made unsuitable to cultivation, sterilized soils and destruction of the fauna in defoliated zones are listed among direct consequences of the spray. However, it is difficult to impute to Agent Orange all effects noticed on the flora since the spray is merely one of the means utilized to prevent farming production and deprive the enemy of food sources. Thus it is agreed that attention should be paid rather to the effects of the war.

If rivers, lakes, and mountains without vegetation are removed, 24% remain of the surface of Vietnam that is not utilized, part of which is a certain number of areas sterilized by the Americans. These surfaces represent a loss of profit that must be evaluated according to their utilization as cultivable and habitable zones, or fauna and flora reserves. Moreover, in order to know exactly the environmental consequences of Agent Orange, it should be agreed to examine accurately the long-term effects of this product on vegetation and the fauna susceptible to being genetically modified.

With respect to losses (in certain cases in terms of sterile soils and wildlife) of the productive capacity (agriculture, hunting and fishing), we should talk about recurrent costs for regeneration and rehabilitation, and the delayed impacts: the farmer must now go farther in less affected areas in search of their subsistence, those areas being not suitable to cultivation if they were not utilized.

Forests

Naturalists have indicated for a long time the decrease of forested areas as a result of the demographic expansion and the movement southwards of populations. With the post-bellum reconstruction, due to the need for firewood and charcoal, forest fires, and slash-and-burn agriculture, Vietnam loses about 200.000 hectares of forests per annum (Kemf, 1988). At present, besides areas intended for agricultural exploitation, we find two extremes of the country, on the one hand, the forests that have not yet been exploited yet (a slight expanse, in zones that are protected or not very accessible), and on the other, the bare soil without vegetation or overrun by herbaceous plants of the *imperata* type. Tropical forests with many levels of vegetation were sprayed several times until the soil was visible: "For the dense forest, the first spray kills some trees. But successive sprays will affect young trees. Two or three sprays can eliminate about 50% of the forest biomass" (Tschirley, 1969). In more damaged areas, herbs or

bamboos, resistant to defoliant, overrun the zones and bring regeneration to a standstill (Blanc, 1988).

Denudation of hills and even flat zones can entail a pronounced deterioration of the fertility of soil due to the disappearance of the canopy which acts protection by preventing torrential rains from eroding sloping soil and compacting flat soil (causing laterization making them unsuitable to planting trees and agriculture). Deforested areas remain subject to frequent floods (often catastrophic) or to drought. When nature “reasserts itself”, the pioneer vegetation often consists of resistant herbaceous plants (the famous *imperata cylindrica* often called “American grass”) or bamboos. Large programmes of planting eucalyptus have also been conducted in those zones.

Damaged and unexploited land accounts for 14 million hectares, of which 6 million are bare land. Regeneration has already started. We must indicate that the return of forest ecosystems to their initial state is a long process for tropical zones: 30 years for mixed forests, 70 years to obtain a stable number of secondary species, and 150 years for species characteristic of primary forests (Blanc, 1998).

An ambitious programme of regeneration and reforestation has been implemented⁹ including: a programme of reforestation of 1,5 million hectares to reconstitute tropical forests (Da Ma forest) and the regeneration of mangrove swamps (such as in Rung Sat near Ho Chi Minh-City, although the proliferation of fish farms constitutes a real danger for mangrove swamps). But there are still large devastated zones, known as “Museums of Agent Orange” (Tully, 2003).

Special mention should be made of mangrove swamps. They play an ecological role of consolidating alluvial deposits carried by rivers, an economic role of making firewood and charcoal, and constitute zones of spawning beds for crustaceans and zones of fish and shrimps farming.

These areas have been particularly damaged by spraying, while they are fragile ecosystems (land vegetation, and land and marine fauna) which do not withstand brutal interventions (Marius, 1989). We estimate that 50% of productive wood and fisheries in Ca Mau mangrove swamps were destroyed (Kemf, 1888). The regeneration of damaged mangrove swamps is now fortunately well advanced (cf. the Can Gio protected zone).

Hot spots

As we may think and hope that traces of Agent Orange tend to disappear in time, research shows there are still high dioxin rates in certain zones, these are the dioxin “hot spots”. For example, this is the case in A Luoi or Bien Hoa. Recent research conducted

⁹ Programme in the framework of the “World Conservation Strategy” launched in 1980 by the International Union for the conservation of nature and natural resources (UICN) in cooperation with the United Nations for Environment (PNUE), the FAO and the UNESCO.

between Quang Tri and Da Nang indicates that 15 out of 20 sites surveyed are particularly contaminated, with at least 60 times as much as the toxicity norm (Tuan Anh Mai, 2004).

Likewise, a recent study made at the Bien Hoa airbase, where there was a large spill of Agent Orange, shows that dioxin rates are particularly high, and also affect people coming to settle there after the war (Schechter et al., 2001). The authors suggest the possibility that contamination is due to dioxin leeching from the soil to the sediment in water, and then attach to phytoplanktons which are ingested by fish, that are then consumed by man. If this hypothesis proves to be correct, then the potential of contamination of man is very important and concerns all population now living in these hotspots.

Measures must be taken to protect the populations and their economic activities: a decontamination must intervene, the populations must be informed and eventually moved away.

Conclusion

While the war came to an end nearly 30 years ago, the lack of research to evaluate the effects of Agent Orange on demographic and economic planes is sorely felt. Today, this question is difficult to study because a lot of time has elapsed and most dioxin has fortunately disappeared. But, following the works of Stellman and the research by CGFED, investigations seem possible and they must be carried out.

Because, apart from the question of compensations and the evidence produced, an in-depth study is necessary: for Vietnam, it is an imperative need that must be met for the sake of development and a question of public health. And the international community, especially the United States, takes a responsibility in this domain, notably from the viewpoint of commitments in the framework of the objectives to be reached in this millennium. We hope that this communication may contribute to the awareness of the necessity of a joint commitment by Vietnam and the international community to make headway in this knowledge.

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