CLIMATE CHANGE VULNERABILITY OF THE *PALA'WANS* IN BUNOG, RIZAL, PALAWAN, PHILIPPINES

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ABSTRACT

The study aims to assess the current situation and vulnerability rate of the *Pala'wans*, one of the major indigenous peoples in Palawan, to climate change in terms of agricultural yield, common plant diseases, water availability, and collected forest products per unit effort. It also seeks to describe the livelihood activities of *Pala'wans*, patterns of change in planting and harvesting schedules, and determine the adaptation strategies to changes by applying indigenous knowledge and the influences of migrants. Triangulation method was used to assess the vulnerability rate of the *Pala'wans* which involved ocular inspection of the site; interviews using questionnaires that were validated in other areas; and key informant interviews among chieftains/elders. Thirty-five household respondents were interviewed which comprised one hundred percent of the total community. The findings revealed that *Pala'wans* have different livelihoods but *kaingin* or slash and burn farming was their main source of income. Others work as laborers or make woodcrafts for a living, among others. There were no changes in the planting and harvesting schedules. The observed effects were the decreased harvest from *kaingin* by approximately ninety percent, rapid increase of pests that damage crops, and unpredictable weather conditions. As a response to the changes, strategies were developed and practiced like burning of roots of "*Peperason tree"* to drive away pests. However, the *Pala'wans* in the area are highly vulnerable to climate change.

Key words: climate change, vulnerability, adaptation, indigenous people, Palawan

1. INTRODUCTION

Indigenous people in the Asian region specifically in the Philippines, inhabit the most marginal and fragile ecosystems ranging from high mountain areas to low-lying zones. Long before industrialization and development occurred in the island of Palawan, an indigenous group of people called *Pala'wan* inhabited the province. The *Pala'wan,* one of the ethnic groups of Palawan, originally settled in the southern part of the island. They have a very simple lifestyle that is highly dependent on the availability of natural resources in their settlements. They hunt for wild animals, use a unique method for fishing, and practice *kaingin* (slash and burn farming) to produce rice and other crops (Docto, 2008). Their houses are made of light materials such as barks of trees and *Batbat* leaves. Additionally, their houses are elevated to keep them safe from wild animals. "Indigenous people from all ranges of the world have an identity and culture that depends upon the natural environment. Their rich and traditional knowledge reflects and

embodies a cultural and spiritual relationship with the land, ocean and wildlife. However, as human activity is changing the world's climate, it alters the natural environment to which indigenous peoples are so closely attached on which they rely heavily" (Gallonway, 2009). Thus, their way of life is threatened by unusual changes in weather due to climate change. This change alters the schedule of farming because of unseasonal dryness or wetness of their farm field. The indigenous people perceive that climate change was made by their god as a punishment or as a challenge but unknowingly, it is one of the consequences of modernization and industrialization. "Indigenous people are the least contributors to climate change, yet they are the first to suffer from its effects" (Tauli-Corpuz, *et al*., 2009).

In the face of climate change effects, *Pala'wans* have been distinctively positioned to adapt in order to survive. The works of Gallonway (2009) discuss that through their culture transmission of knowledge over thousands of years, indigenous peoples are unique repositories of learning and knowledge on successfully coping with local-level climate change and effectively responding to major environmental changes.

Pala'wans are on the forefront of adapting to climate change. They have already observed the effects of climate change and are already using their traditional knowledge and survival ability to address this phenomenon. Thus, applying traditional knowledge and practices of *Pala'wans* are very important in sustaining and managing the environment. Furthermore, it provides solutions to the existing climate change effects. The works of Tauli-Corpuz, *et al*., (2009) discuss that indigenous peoples do not only suffer from climate change but they can also provide solutions to this problem.

This paper identifies the activities and livelihood of the *Pala'wans*; their perceived changes on agricultural yield, gathered wild products, water availability, pests or diseases that affect their crops and other fruit trees for at least five years; their vulnerability rate due to climate change; and their adaptive strategies to climate change.

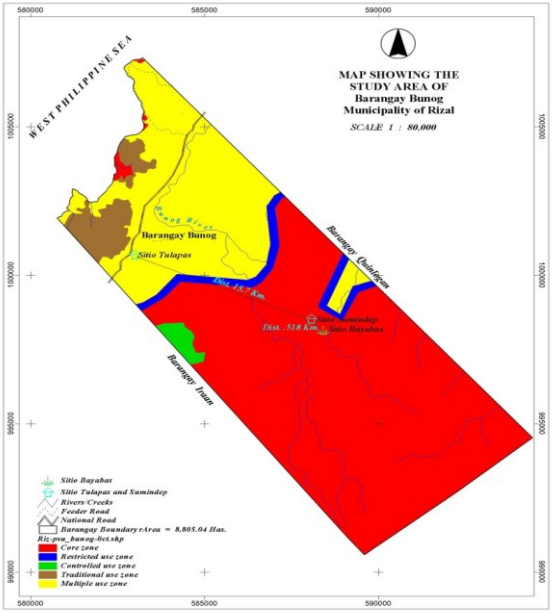
2. MATERIALS AND METHODS

The study was conducted in the villages of Sumindep, Bayabas and Tulapos within the vicinity of Barangay Bunog, Rizal, Palawan. The coordinates of the site are 09°01.978' N and 117°48.083' E with an elevation of 190 meters above sea level. Generally, it is hilly-mountainous because it is part of Mount Mantalingahan, the highest mountain range in the province with an elevation of 2,086 meters (see Figures 1 & 2).

The researchers utilized the triangulation method that includes ocular inspection of the site; key informant interviews (KIIs) among elders and chieftains; focus group discussions (FGDs); and open-ended interviews using questionnaires that were validated in other areas. To calculate the vulnerability rate of the *Pala'wans* in the area, the researchers used the formula adopted from Labuguen, *et al.,* (2012), "vulnerability = risks – adaptive capacity". Furthermore, indices from 0 to 5 (0=none, 1=very low, 2=low, 3=fair, 4=high and 5=very high) were assigned to estimate the vulnerability rate.

Source: travellinginindonesia. Retrieved on: 08/12. Available at http://www.google.com/wpcontent/uploads/palawanmap.jpg

Figure 1. Location Map of the Municipality of Rizal, Palawan (pointed by red arrow).



Source: Palawan Council for Sustainable Development (PCSD)

Figure 2. Map of the Study Area at Barangay Bunog, Rizal, Palawan.

3. RESULTS AND DISCUSSION

3.1 Livelihood Practices

Farming, particularly *kaingin* (slash and burn) is the main source of livelihood and food of the *Pala'wans* . They usually plant rice, *kamoteng kahoy, gabi* and *linga* in *kaingin*. However, the *Pala'wans* also have engaged in backyard farming, usually planting easy to grow vegetables such as *kamote* tops, squash, *alugbati*, and *ganda* (*sibuyas-sibuyas*) as their alternative food source. They have also planted a few trees such as jackfruit, *malunggay*, and coconut trees to add to their food sources. Additionally, the *Pala'wans* also gather food from the forest such as wild banana, *rambutan*, *labong*, *natok*, *ubod* of *batba*t, *bago,* and *lumot-lumot*. They are also able to gather rattan, *bagtik,* resin (*almaciga), and salong* which they use for their households. As hunters, the *Pala'wans* capture wild boars (*baboy damo*) from the forests and fish, *udang* (shrimp), *kerepay* (hermit crab) from rivers, creeks, and streams. Aside from this, *the Pala'wans* have also domesticated animals like chickens and pigs for additional income or food and cats and dogs as pets.

Table 1. Schedule of Activities of the *Pala'wans* in the Whole Year.

ACTIVITIES	Dry Season						Wet Season					
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Kaingin (clearing, burning, planting)					■	■	■					
Gathering of forest products						■	■	■				
Seeking other foods			■	■	■	■	■	■	■	■		
Planting of other plants							■	■				
Working in the lowlanders as labourer	■	■										■
Making of woodcrafts like baskets and *kiba*						■	■					
Kaingin (Harvesting)										■	■	

The total average hectare of lands that the *Pala'wans* have in the *Sitios* of Bayabas & Sumindep is about 20 hectares. The said parcels of land are scattered all over the *sitios* and were commonly used for *kaingin*. The way they plant follows the sustainable concept based from a belief that when an area has been used for *kaingin*, they need to transfer to another area for the new planting processes. They will go back to the utilized areas and practice the same activities again after many years depending on the development of the site wherein it has returned to a forested state. *Pala'wans* believed that the land needs to recover so that the nutrients of the soil will be replenished so their plant will grow well and produce a bountiful harvest. The *Pala'wans*

understands that the soil quality diminishes when it is periodically or continuously used. Thus, harvested crops and rice will be less; enough only to serve as seedlings (*binhi)* for the next planting season.

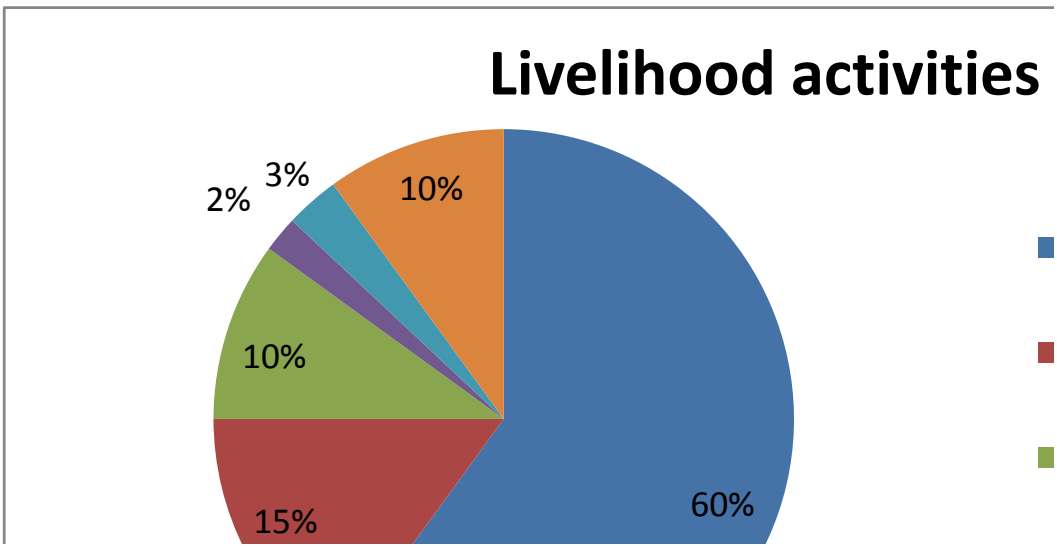


Figure 3. Different Livelihoods of the Pala'wans with Corresponding Percentage Based from their Responses.

3.2 Farming Practices of the Pala'wans

The *Pala'wans* have their own techniques of scheduling their planting and harvesting period. They wait for the signs: the appearance of stars, specifically the big dipper constellation after full moon or *Damar* because of the belief that the bright light of the moon allows pests to destroy what they have planted.

The process of preparation for *kaingin* involved both the traditional practices of the *Pala'wans* and the farming schedules based in their calendar as can be seen in Table 2 below:

Table 2. Seasonal Farming Activities of the *Pala'wans* in their *Kaingin.*

MONTH	ACTIVITY
December – January	*Ririk* (under grass cutting)
February – March	*Tebeng* (tree cutting)
March – April	*Togda* (rice planting)
May – June	*Ilamon* (removing grass in *kaingin*)
June – August	Guarding of their *kaingin* from birds or other animals that might destroy their plants
August – September	Harvesting
October – December	Working for lowlanders for alternative income; gathering of *almaciga*

A *pinadongan* is built at the center of the field before the planting period as a tradition/belief. All kinds of seeds that the *Pala'wans* will plant are placed in the *pinadongan* as a sign of

thankfulness and praise for their god. During planting season, tasks are divided between men and women – the men made holes in the soil using pointed wooden spears while the women place the seeds inside the holes.

3.3. Observed Effects of Climate Change and the Corresponding Adaptive Strategies

Being closely linked with the environment for many years, the *Pala'wans* learned to develop strategies based from their traditional knowledge in order to cope with and survive in the changing environment. Moreover, they have also learned to adopt some of the foreign technologies from lowlanders.

The *Pala'wans* continue to plant rice during the months of March to April and harvest crops from August to September based on their traditional belief of using stars as guide for farming. However, the *Pala'wans* attested that climate change[1] has notable effects in the yields of the crops as show in table 3 below:

Several changes have been observed by the *Pala'wans* in the past few years, including about a 90% decrease in harvests from *kaingins* and rapid increase of pests in the farmlands. The common pests found were black bug, different kinds of worms, *tiyangaw,* flies, and termites which damage the roots and stalks of the rice plant. The increase in pests, decrease the amount of crops harvested, thus resulting to food shortages. To lessen the number of pests in *kaingin*, the *Pala'wans* practice *pagpapausok* or burning or of the roots of the "*Peperason tree"*; its smoke is believed to drive away the insects. However, this strategy has become ineffective since the insects have developed immunity to the smoke. Hence, the *Pala'wans* have adopted modern technologies from lowlanders such as using pesticides and insecticides to get rid of the pests. Nonetheless, the *Pala'wans* still find this problematic since they do not have the financial resources to buy artificial fertilizers or chemicals for farming purposes. Other modern technologies have also been adopted by the *Pala'wans* such as using air guns for hunting as well as for protection against wild animals. To augment their income, the *Pala'wans* also work as laborers for lowlanders, make indigenous products such as baskets from rattan and *bilao* and mats from *batbat* leaves which are sold in the *barrios*, and put up *sari-sari* stores. These serve as alternative sources of income for food and other basic needs.

[1]The *Pala'wans* didn't know the term "climate change" itself or "*pagbabago ng klima"* but they have noticed that there were changes in their environment. They don't know the scientific reason but to their belief, it is the punishment being given by God, *"Empo".* According to them, the reasons behind these were the wrong doings of humans like abusing, damaging, and destroying their environment or the unwise utilization of the resources that are found in the environment.

Table 3. Observed Changes Due to Climate Variations in Terms of Agricultural Yield, Common Plant Diseases/Pest, Water Availability, Collected Forest Product Through the Years.

ISSUES/ CONCERNS	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Agricultural yield	10-20 sacks	10-12 sacks	5-10 sacks	5-10 sacks	2-7 sacks
Common plant diseases/ pest	Moderate[2]	High[3] (*Tiyangaw,* black bug, different worm, flies, termites).	High (*Tiyangaw*, black bug, different worm, flies, termites).	High (*Tiyangaw*, black bug, different worm, flies, termites).	High (*Tiyangaw*, black bug, different worm, flies, termites).
Water availability	Moderate (have deep well)	Moderate (have deep well)	Slightly moderate (no deep well, creek slowly lowering the water level)	Low (no deep well, creek dries up)	Low (no deep well, creek dries up)
Collected forest product per unit effort	Moderate	Low[4]	Low	Low	Low

Another factor perceived to be affecting the crop yield is the unpredictable weather conditions. The rapid changes in weather conditions have affected the crop yield as shown in figure 4 below.

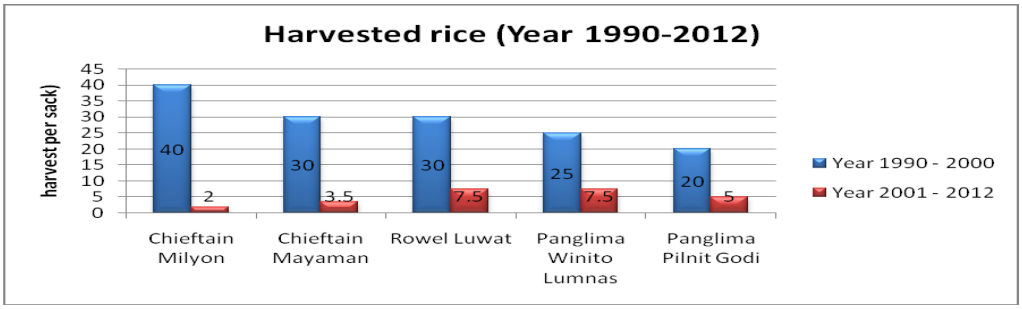


Figure 4. Comparison of the Harvested *Palay* from the *Pala'wans'* Respective *Kaingin* (1990 to 2012).

[2] **Moderate rate,** the changes in their living were quite observable but can be still managed by the *Pala'wans* through applications of indigenous' adaptation strategies. Adequate water supply can be found in the area (deep well and creek); and the amount of forest products were still enough for their needs.

[3]**High rate** indicates the estimated volume of products being observed by the *Pala'wans.* Pests and diseases severely affected the crops. Strategies done in the past to lessen or solve the problem were ineffective.

[4]**Low rate** implies that the changes being experienced were severe, deep wells were drying up and water level is low. Also, the amount of the forest products collected has declined dramatically and aggravated food supply affecting survival of the *Pala'wans.*

Figure 5 below shows the five-year mean (2007-2011) and ten-year mean (2002-2011) rainfall patterns of the study area from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Puerto Princesa City station. The graph indicates the relative differences between the trends of rainfall and signifies that there was an alteration to its yearly distribution. There were great changes in rainfall pattern between the five-year mean (2007-2011) and ten-year mean (2002-2011) during the month of August (75 mm) and November (50 mm). Moreover, in 2011 rainfall, there was an excess of 100 mm of rainfall during the month of May compared to the five and ten-year mean of rainfall. For the month of October to November there was a deficit of 125 mm of rainfall. These alterations greatly affect the crop production of the *Pala'wans*. The highest and lowest point of the rainfall presents irregularity and unpredictable flow of weather which was the possible effect of climate change.

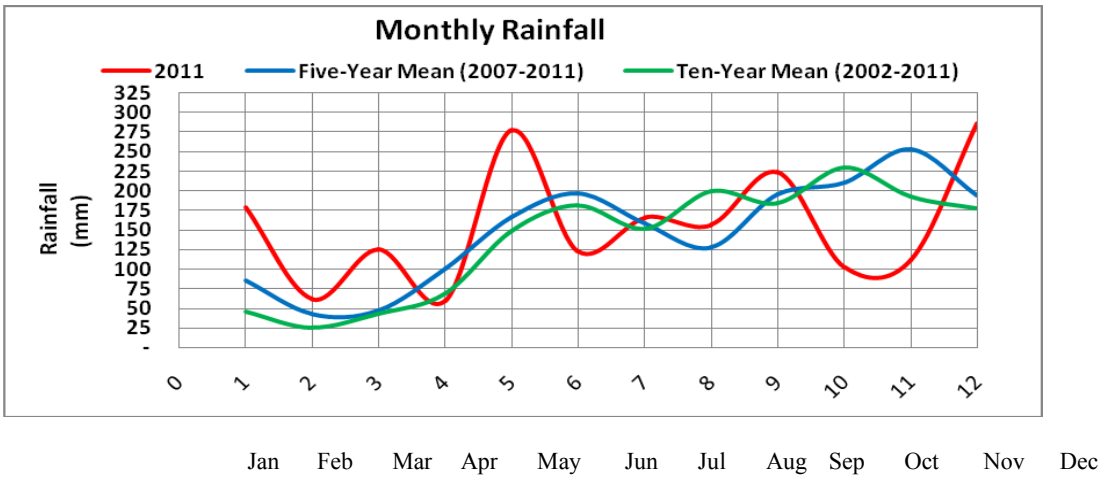


Figure 5. Rainfall Pattern from Year 2002-2012 in the Municipality of Rizal, Palawan.

Table 4 below illustrates the observed changes of the *Pala'wans* that affect their livelihood activities with corresponding adaptation strategies to cope and survive.

Table 4. Observed Changes in *Kaingin*, Gathered Forest Product, Availability of Water, and Plant Diseases/Pest with their Corresponding Adaptation Strategies.

ISSUES/CONCERNS	OBSERVED CHANGES (2008-2012)	ADAPTATIONS
Kaingin	Harvests were decreased, approximately 90% according to Chieftain Milyon	Use of calendar method for planting and harvesting
Gathered forest product	Decreased for about 80%-90% based from their responses and ocular inspections of the team	None
Availability of water (creeks and deep well)	Lowered water level of creeks; & dried deep well	Improvised pipe made of bamboo stem (spring)
Plant diseases and pest	Increased of different kinds of pests (black bug, *tiyangaw*, etc.) Their planted *palay* became yellowish in color	Smoking/*'pagpapausok'* (*Peperason tree)* and other roots of trees, use of insecticides

3.4 Vulnerability Rate of the Pala'wans

The researchers have found that the condition of the *Pala'wans* in Bunog puts them at high risk due to climate change. The rate was computed using the developed formula of Labuguen, *et al.* (2012): vulnerability = risks – adaptive capacity.

The risks and the adaptive ways had been rated based from the responses and encountered experiences of the *Pala'wans*. The rates were from zero (0) to five (5) with corresponding criteria to assess their vulnerability conditions.

Legend: 0- none, **1**- very low, **2**- low, **3-** fair, **4**- high, **5**- very high

For risks: ***very high rate*** **(5)** implies that the changes being observed by the *Pala'wans* were very severe and with less adaptive strategy; ***fair rate*** **(3)** signifies that the changes in their living were quite observable and the *Pala'wans* can still manage the problem using their adaptation strategies; ***very low rate*** **(1)** implies that the changes/problems were manageable and have little effects to the *Pala'wans*; and ***none rate (0)*** implies that there is no problems being encountered. Other rates were in between.

For adaptation: ***very high rate*** **(5)** signifies that the adaptive capacity is very effective even there were serious problems/changes being encountered; ***fair rate*** **(3)** means, the strategies were effective but with lesser capacity when serious event comes; ***very low rate*** **(1)** implies that the ways of adaptation were less effective to ineffective but still applicable at some point; and ***none rate (0)*** implies that there is no other adaptive strategies that can make beyond the problems/risks encountered. Other rates were in between.

Table 5. Climate Change Vulnerability of the *Pala'wans*

Climatic Event	Rate	Affected Areas	Adaptation	Rate
Forest Fire	5	Indigenous peoples' domain	None	0
Pests	4	Crops	Pesticides	1
Altered planting season	4	Crops	IP's IK	2
Altered rainfall	4	Environment: • Fields &Crops • Creeks • Health	None	0
Decline of gathered forest products	4	*Pala'wans*	None	0
Water shortage	4	*Pala'wans* animals environment	Spring/other	1
TOTAL	25			4
AVERAGE	4.16			0.6

Vulnerability = risks – adaptation
= 4.16 – 0.6
= 3.56 (highly vulnerable)

4. CONCLUSION

The *Pala'wans* in Bunog, Rizal, Palawan living in the sitios of Tulapos, Sumindep and Bayabas were affected by climate change. Their livelihood activities such as *kaingin*, and gathering of forest products among others, have been affected by climate change.

Although there have been no changes in the planting and harvesting patterns of the *Pala'wans* since they still follow their traditional beliefs regarding farming, the harvests from *kaingin* decreased by approximately 90%. The decrease in harvests is thought to be due to rapid increased of pests that damaged their crops in the past years. Moreover, the changes in rainfall pattern were perceived to have greatly affected the *Pala'wans.* Furthermore, the amount of non-timber forest products gathered by the *Pala'wans* per unit effort has also decreased in the last five years.

Although the *Pala'wans* continue to use their traditional knowledge and indigenous strategies as a means of their survival and adaptation to the changing environment, they have also adopted modern technologies to help them cope with the decreased production of agricultural crops. Even though the *Pala'wans* have proven themselves to be adaptable to the changes in their environment, they are still highly at risk to the climate change with a 3.56 vulnerability rate.

5. RECOMMENDATIONS

Based from the result of the study, the researchers came up with the following recommendations:

1. Introduce livelihood programs and conduct seminars on sustainable agriculture in cooperation with the Department of Agriculture to improve agricultural yield.
2. Enhancement of their agricultural production with improved variety of seeds.
3. Introduce programs through the Local Government Unit (LGU) like solar panel with batteries and energy efficient light bulb to give them comfortable light to avoid fire incidents; and installation of a water pump that will serve as their main source of safe drinking water.
4. Establishment of a learning center for the *Pala'wans* that will be managed by elders so that the *Pala'wans* learn how to read and write as well as enhance their knowledge about climate change.
5. The *Pala'wans* must participate in all aspects of planning, program implementation, decision-making, and evaluation of programs especially in local meetings.
6. To provide copy of the result of this study to the Local Government Units (Province of Palawan and the Municipality of Rizal) and the Non-Government Organizations (NGOs) and National Commission on Indigenous People (NCIP) for their information.
7. Conduct further studies on the present conditions of the *Pala'wans.*

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