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Co-management as a Strategy of Environmental Conservation of Fisheries Resources in Beaches in Mbita, Kenya

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ABSTRACT

Little is known on effectiveness of community involvement in the management of Lake Victoria which supports over tens of millions of people. Co-management approach in fisheries management was adopted due to failure of the traditional fisheries management approaches. The continued decline in fish catch despite the implementation of the concept of co-management triggered the current study in beaches of Mbita District, Kenya. The objective of the study was to investigate the extent to which co-management has contributed to environmental management in beaches of Mbita District. The results of this study are useful in the formulation of policies on the management of fisheries resources at the beach and similar environments in the neighbourhood and beyond. They make important inputs to the body of existing knowledge on beach management. A cross-sectional survey design was used as a research design due to the expansive coverage of the study area. The research instruments were mainly questionnaires. The total population of the study comprised of 9,360 fisheries stakeholders who are members of 62 beaches in Mbita District, Kenya. A sample size of 384 was statistically derived from the target population to represent the entire population. Statistical sampling method was used to sample the beaches in the three divisions proportionately according to their percentage weight in terms of population size. Furthermore, a statistical theory sampling technique was used to sample beaches due to large numbers and expansive distribution along the shores of Lake Victoria. The data was analyzed using descriptive statistics and findings presented in tables. The study found that co-management approach had positively influenced fisheries resource' conservation in Mbita District; and it established that co-management as strategy is effective in awareness creation in environmental management among the fisheries stakeholders and is key to a safe and healthy environment and active involvement of natural resource users such as the members of Beach Management Units (BMU) in environmental management. .Environmental management and participatory formulation of fisheries laws and regulations had been enhanced at the beaches in the district. The study recommended further study on co-management in other types of natural resource.

1.0 Introduction

1.1 Background of the Study

The idea of co-management approach as a strategy for conservation of fisheries resources in Kenya was initiated in late 1990s when the three East African Countries agreed to form Beach Management Units (BMUs) under Lake Victoria Fisheries Organization (L.V.F.O) secretariat as the local entities at the beach level that enables the fishing communities to participate in co-managing the fisheries resources of Lake Victoria. Co-management is seen by economists as a possible approach to increasing the cost effectiveness of fisheries management through lowering the ex-post-transaction costs, for example, the costs involved in implementation and enforcement (Nyeko et al, 2004).

The number of BMUs that were formed in Kenya was three hundred and six (306) (Imende et al. 2005). Beach Management Units (BMUs) were introduced to provide an opportunity for poor, marginalized groups such as fishing crew and women to engage in decision-making processes that affect the management of fisheries resources' upon which their livelihoods are based.

The core problems of increasing human populations and increasingly intensive land-use in lake catchments and shorelines threaten the sustainability of fisheries resources. Fisheries management institutions in Kenya accepted that the traditional centralized, control-and-command approach to fisheries management had failed to safeguard fisheries resources and the livelihoods of millions of people dependent upon these resources. They therefore adopted a fisheries co-management approach, involving the establishment of legally empowered community organizations called Beach Management Units (BMUs) for planning and management of fisheries resources in partnership with national and local governments (Scullion, 2007).

Mbita District has 62 BMUs in total (Imende et al. 2005). The national legislation that supports B.M.U was completed in 2005. Initially they operated with the powers delegated by the Director of Fisheries under the Fisheries Act Cap. 378.

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In Mbita District beaches, there has not been a comprehensive evaluation of co-management approach as a strategy for conservation of fisheries resources to determine its outcomes. The study therefore sought to fill this gap in knowledge to ascertain change in the management of fisheries resources since the adoption of the co-management strategy.

1.2 Objective of the Study

The objective of this study was to investigate the extent to which co-management has contributed to environmental management in beaches of Mbita District, Kenya.

1.3Concept of Co-Management in Fisheries Resources' Conservation

Co-management is defined as a partnership arrangement between government and resource harvesters in which responsibilities and decision making for resource management is shared (Jentoft & Pinkerton, 1989). The co-management approach to commercial fisheries can be very effective in implementing regulations and other management measures, because all stakeholders are involved in the decision-making process. In fact, it would be impossible to implement some regulations properly without the involvement and support of fisheries resource users. For example, before making a regulation to restrict the use of a type of fishing gear such as gill nets in a particular area, fishers would need to be consulted about the appropriateness and effectiveness of the regulation (Watt, 2001).

1.4 Co-Management and Environmental Management

As in many parts of the world, overexploitation of fisheries is common in Africa. Traditionally, fishery management was entrusted to community leadership, typically a Chief working with the support of a council of elders. The fishery resource was often perceived as a gift from nature or various deities who made their wishes known through the elders. Rituals and sacrifices were often associated with traditional African fisheries management (Khan et al, 2004). Co-management has been used extensively in Africa, as part of the overall trend toward community-based natural resource management. Most co-management arrangements on the African continent have been introduced and driven by governments, often as a result of NGO or donor initiatives, and remain largely top-down (Hara and Raakjær Nielsen, 2003). The motivation from the government's perspective has been access to information at the local level (Wilson, 2003a), particularly to aid enforcement (Haraldsdottir, 2000).

In Kenya, increased exploitation and environmental degradation have been major threats to breeding and survival of fish. There are indications of changes in stock densities, spatial and temporal distribution and life history parameters. The mean standing stock of Nile perch which is the main economic back-born has declined from 1.2 to 0.55 million tonnes between 1999-2001 and 2005-2008 (Lwenya, et al, nd). According to Menn and Anyango, (2010), the main identified needs on improvements sanitation at the beaches are the installation of racks, shades and storage facilities.

2.0 Research Methodology

2.1 Research Design and Target Population

The study adopted a cross sectional survey. The survey design was appropriate in this study because of expansive coverage of the district. Given that, Mbita district is one of largest riparian district bordering the waters of Lake Victoria, and that it is an area with high involvement of community members in fisheries resource conservation, surveys are justified as the best method of data collection, considering issues of economy of the design, rapid data collection and ability to understand a population from a part of it (Oso and Onen, 2005). Study questionnaires were used to elicit wide range of information about the relationship between variables.

This study was conducted in Mbita district, Kenya where 62 Beaches (Fish Landing Sites) with a population of 9,360 BMUs stakeholders who were used as the target population. This target population was obtained from District BMU register at Suba/Mbita District Fisheries Office. Table below shows BMU's population distribution in Mbita district by percentage weight.

Table 2.1. BMU Population Distribution in Mbita District.

Division	Population	Percentage Weight
Mfano	4567	49
Lambwe	370	4
Mbita	4423	47
Total	9360	100

Source**:** District BMU registers, Suba/Mbita District Fisheries Office, 2010

2.2 Sample Size and Sampling Procedure

Sample Size

From the target population, there are a total of 9,360 members from the 62 BMUs. The sample size was determined using Fisher et al (1998) formula. At 95% confidence level and 50% target population, the sample is assumed to have characteristics of interest with a Z-statistic of 1.96.

Thus using the formula

$$n = \frac{N}{1+Np2}$$

Where n = desired sample size

N is the population; p = 0.05

$$n = \frac{9360}{1+9360(0.052)} = 384$$

Therefore 384 respondents were interviewed in the 62 BMUs

Sampling Procedure

There are 62 BMUs in Mbita District with a population size of 9360 spread across Mbita, Lambwe and Mfangano Divisions. Given that the sample size is 384, a proportionate sample can be derived from each division.

Statistically a large enough sample is 30, where n = 30 (Keller, 2009). In sampling Beach Management Units (BMUs) in the three divisions, the number of people to be interviewed in the three divisions per BMU was proportionately derived.

2.3 Research Instruments

Questionnaire was used as instrument for data collection in the study. The instrument had both open and closed ended questions for generation of qualitative and Quantitative data.

Pilot Testing

A pilot study of the instrument was conducted in two BMUs (Tabla and Sindo Main) in central Division, Suba district which were purposively sampled. The beaches are outside the study area and have similar characteristics with the target population. 12 respondents from the two BMUs were used in the pilot test. According to Mugenda and Mugenda (1999), pilot testing help refine research instrument. This enabled identification of possible weaknesses of the instrument. The questionnaires were administered by research assistants under supervision of the researcher.

3.0 Results and Discussions

The extent to which co-management has contributed towards environmental management in Mbita beaches. Environmental management is a core component of co-management.

It encompasses the existence of sanitary facilities, general cleanliness and garbage disposal at the beaches. This section presents the influence of co-management strategy on environmental management at the beaches of Mbita district. Availability of sanitary facilities at the beaches was used as an indicator for environmental management of Mbita district beaches.

3.1Sanitary Facilities at the Beach

Sanitary facilities are generally pit latrines, bath rooms, garbage disposal containers among others. In order for the study to evaluate co-management strategy, it was necessary to find out from the respondents whether the beaches already have sanitary facilities. The responses to this question are displayed in Table 3.1.

Table 3.1. Sanitary Facilities at the Beach.

Sanitary Facilities	Frequency	Percentage
Yes	311	90.67
No	27	7.87
Not specified	5	1.46
Total	343	100

From Table 3.1, it was established that out of 343 respondents, majority of BMU members 311 (90.7%) said that the beaches have sanitary facilities such as bathrooms and latrines that are used in the beaches, 27 (7.9%) said the beaches did not have these sanitary facilities put in place while 5 (1.5%) did not respond to this question. This indicates an element of success in putting up sanitary facilities in beaches of Mbita District. The findings can be compared to a study on co-management in Uganda by Odongkara, (2009) which found out that the Local Government officials, namely councillors and Members of Parliament, had helped in construction of access roads, fish slabs and toilets in beaches of Uganda. Table 3.2 displays the sanitary facilities in beaches of Mbita District.

Table 3.2. Sanitary Facilities at the Beach.

Response	2-Door Latrines		4-Door Latrines		2-Door Bathroom		4-Door Bathroom	
		%		%		%		%
Yes	145	42.27	122	35.57	33	9.62	35	10.20
No	167	48.69	190	55.39	279	81.34	277	80.76
Not specified	31	9.04	31	9.04	31	9.04	31	9.04
Total	343	100	343	100	343	100	343	100

Table 3.2 shows that out of 343 respondents in beaches of Mbita district 145 (42.3%) had two door latrines, 122 (35.6%) had 4 door latrines, 33 (9.62%) had 2 door bathrooms and, 35 (10.2%) had 4 door bathrooms. Other sanitary facilities that were mentioned by the respondents included ten door, three door latrines, five doors, six doors, seven doors, eight door latrines and bathrooms for individuals. 124(36.2%) of the respondents did not specify the type of latrines nor bathroom available at their beaches. It can therefore be concluded that although there are a significant number of sanitary facilities at the beaches of Mbita district, majority of the population still bath directly in the lake. This further confirmed to the study of Odongkara (2009) who established that Local Governments officials, namely the, councillors and Members of Parliament had helped in construction bathrooms and toilets in beaches of Uganda, though not adequately.

Further to availability of latrines and bathrooms, the respondents were asked whether the beaches in Mbita district had fish *bandas* (Sheltered fish Auction Centre which are hygienically permitted by public health department as fit for fish sales) in place and whether fish drying racks that are hygienic in nature are available in their beaches and the responses to the questions are as tabulated in Table 3.3.

Table 3.3. Existence of Fish *Banda* and Fish Drying Rack at the Beach

Response	Fish Band Exists		Racks Exist	
	F	%	F	%
Yes	269	78.4	88	25.7
No	69	20.1	246	71.7
Not Specified	5	1.5	9	2.6
Total	343	100	343	100

From the findings, out of 343 respondents 269 (78.4%) of the BMU members acknowledged the existence of a fish *bandas* in beaches of Mbita district. 69(20%) of the respondents admitted non-existence of the facility. On fish drying racks, only 88(25.7%) respondents of 343 said that the racks existed. Majority of the respondents 246(71.7%) said that the fish drying racks are not at their beaches. The findings imply that, although there are many fish auction centers (fish *bandas*) in beaches of Mbita district, the fish drying racks for smaller species are very limited in number. The findings correspond with a study by Odongkara (2009) on co-management in Uganda which acknowledged the existence of fish slabs in beaches of Lake Victoria.

3.2Frequency of Cleaning the Fish *Banda*s

Availability of a fish *banda* at the beach necessitates regular cleaning to comply with the requirements of environmental management as a component of co-management strategy in conservation of fisheries resources' in the district. The researcher went further to probe the respondents on the frequency of cleaning the fish *bandas* in the beaches of Mbita District and the results were displayed in Table 3.4.

Table 3.4. Fish *Banda* Cleaning Frequency.

Fish Banda Cleaning	Frequency	Percentage
Everyday	240	89.3
Once a week	22	8.2
Every two days	2	0.7
Anytime	2	0.7
Twice a week	2	0.7
Don't know	1	0.4
Total	269	100

Out of the 269 respondents who specified existence of fish *banda* within their beaches (in table 4.24), majority 240 (89.3%) said that fish *bandas* are cleaned daily, 22 (8.2%) of the respondents said that they are cleaned once a week, and 2(0.7%) are cleaned every two days, anytime or twice a week. This implies that there is significant cleanliness at fish *bandas* in beaches of Mbita district. The findings confirms the study of Odongkara (2009) that most fishers are involved in different general cleaning/sanitation activities either directly or by giving money to BMUs with a purpose of cleaning the beach.

3.3Garbage Disposal at the Beach

Solid waste management and disposal is crucial in ensuring a clean and healthy environment at the beaches. Garbage is disposed of in various ways that include burning and recycling among other methods. In order for the researcher to know whether the beaches have established garbage disposal facilities and guidelines at the beaches, the BMU members in Mbita district beaches were asked to state how they dispose of their garbage at the beach and the responses to this question are as tabulated in Table 3.5.

Table 3.5. Garbage Disposal at the Beach

Response	In the Lake		In a Pit		Burning	
	F	%	F	%	F	%
Yes	24	7.0	166	48.4	237	69.1
No	309	90.1	166	48.4	96	27.9
Not Specified	10	2.9	11	3.2	10	3.0
Total	343	100	343	100	343	100

From Table 3.5, it was established that out of 343 respondents in Mbita district, majority 237 (69.10%) disposed garbage by burning, 166 (48.40%) disposed garbage in a sanitary pit and 24 (7.00%) dump the garbage in the lake. Only 31(9.1%) of the respondents did not specify how they disposed of garbage at the beaches. The findings imply that most BMU members in Mbita district beaches do not dispose garbage in the lake which demonstrates environmental awareness created through co-management. The findings are in line with a study by Omom (2009), on HIV and AIDS and Artisanal Fisheries Nexus along the beaches of Lake Victoria which observed that the functions of BMU include resolving conflict, establishing beach hygiene and sanitation facilities, and the establishment and maintenance of beach infrastructure

3.4The Influence of the Existence Sanitary Facilities on Environmental Management of Mbita District Beaches

In order to determine the influence of sanitary facilities on environmental management, the researcher cross-tabulated existence of sanitary facilities at the beaches of Mbita district as a predictor variable and existence of permanent fish *banda*s. The findings are tabulated in Table 3.6.

Table 3.6.Cross Tabulation between Existence of Sanitary Facilities and Availability of Fish *Banda*

Availability of Fish *Banda*s	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Yes	248	72.3	20	5.8	1	0.3
No	62	18.1	7	2.0	0	0
Not Specified	1	0.3	0	0	4	1.2

Table 3.6 shows that out of 343 respondents 248 (72.3%) of BMU members said that there were permanent fish *bandas* at beaches of Mbita District and existence of sanitary facilities. Only 62(21.35%) of the respondents indicated that there were sanitary facilities at the beaches but fish *banda* were not available. 20(5.8%) of the respondents specified that although fish *bandas* were available, sanitary facilities did not exist. It can therefore be concluded that majority of beaches where a *banda* exist, there are sanitary facilities. This confirms the study of Omom (2009) on HIV and AIDS and artisanal fisheries nexus along the beaches of Lake Victoria which established that in the past, money raised from the BMUs has been used to purchase a weighing scale, build a *banda* (BMU centre), build toilets, and purchase some communal legal fishing gear.

3.5 The Frequency of Cleaning the Fish *Banda*s and Environmental Management of Mbita Beaches.

The researcher cross-tabulated the existence of sanitary facilities and frequency of cleaning the fish *banda* so as to determine its influence on environmental management at the beaches in Mbita District and the findings are shown in Table 3.7.

Table 3.7. Cross-Tabulation between Existence of Sanitary Facilities and Frequency of Cleaning Fish *Bandas*

Cleaning Fish *Banda*	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Everyday	225	74.3	14	4.1	1	0.3
Once a week	20	5.8	2	0.6	0	0
Any day	4	12	3	0.9	0	0
Not Specified	62	18.1	08	2.3	4	1.2

Table 3.7 shows that out of 343 respondents, majority 255(74.3%) of BMU members in beaches of Mbita district, where sanitary facilities exist, and fish *banda*s are cleaned daily on a daily basis. It was also established that 20(5.8%) of the respondents clean their *banda*s on a weekly basis. A significant number 62(18.1%) did not specify the relationship between existence of sanitary facilities and frequency of cleaning the *banda*. A minority of 5(1.5%) respondents did not specify the existence of sanitary facilities but indicated that fish *banda* was cleaned at different intervals. It can be concluded that in Mbita district, where sanitary facilities exist, fish *banda*s are cleaned daily. Therefore the study concurs with the study of Omom (2002) that the functions of BMU include resolving conflict, establishing beach hygiene and sanitation facilities, and the establishment and maintenance of beach infrastructure.

3.6The Influence of the Existence of Drying Racks on Environmental Management of Mbita Beaches

The researcher cross-tabulated the predictor variable and fish drying racks so as to determine environmental management at the beaches in Mbita District. The findings are shown in Table 3.8.

Table 3.8. Cross-Tabulation between Existence of Sanitary Facilities and Fish Drying Racks at the Beach.

Availability of Fish Drying Racks	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Yes	78	22.7	10	2.9	0	0
No	227	66.2	16	4.7	3	0.9
Not Specified	6	1.7	1	0.3	2	0.6

Table 3.8 indicates that only 78 (22.7%) of the respondents said that sanitary facilities exist at their *banda* and fish drying racks are available 16(4.7%) respondents specified that neither sanitary facilities exists nor fish drying racks at the beaches. This implies that majority of beaches 227 (66.2%) admits existence of sanitary facilities but with few fish drying racks which means that fish is mostly dried in unhygienic conditions which confirmed the study of Menn and Anyango (2010) on Omena fishery and "Sex for Fish" at Lake Victoria which established that the main identified needs along the beaches are on improvements and installation of racks, shades and storage facilities.

3.7The Influence of Disposing Garbage in the Lake on Environmental Management of Mbita Beaches

The researcher cross-tabulated the predictor variable existence of sanitary facilities and disposal of garbage in the lake in order to determine environmental management at the beaches in Mbita District and the findings are shown in Table 3.9.

Table 3.9. Cross-Tabulation between Existence of Sanitary Facilities and GarbageDispose in the Lake

Garbage Disposal in the Lake	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Yes	23	6.7	0	0	1	0.3
No	281	81.9	26	7.6	2	0.6
Not Specified	7	2.0	1	0.3	2	0.6

From Table 3.9, the study found that although majority of beaches in Mbita District 281(81.9%) admit existence of sanitary facilities at their beaches, only a few of them 23(0.07%) dispose garbage to the lake. 26(7.6%) of the respondents indicated that sanitary facilities did not exist at the beaches and that they did not dispose garbage to the lake. This implies that the pollution of the lake through garbage disposal has reduced due to existence of sanitary facilities at the beaches. This supported by the study of Omom (2009) on the roles of BMU, that include resolving conflict, establishing beach hygiene and sanitation facilities, and the establishment and maintenance of beach infrastructure.

3.8 The Influence of Disposing Garbage in the Pits on Environmental Management of Mbita District Beaches

The researcher cross-tabulated the predictor variable existence of sanitary facilities and disposal of garbage in the pits so as to determine environmental management at the beaches in Mbita District and the findings are shown in Table 3.10.

Table 3.10. Cross-Tabulation between Existence of Sanitary Facilities and Garbage in the Pits

Garbage Disposal into Pits	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Yes	155	45.2	9	2.6	2	0.6
No	149	43.4	17	4.9	0	0
Not Specified	7	2.0	1	0.3	3	0.9

From Table 3.10, the study found that although majority of beaches in Mbita District 155(45.2%) admits existence of sanitary facilities at their beaches, a significant number 149 (43.3%) dispose garbage in the pits which is a positive indicator on environmental management because it implies that members of BMU in Mbita beaches are significantly sensitized on garbage disposal. 17(4.9%) respondents indicated that sanitary facilities did not exist and garbage was not disposed in the pit while 9(2.6%) who specified that sanitary facilities did not exist indicated that they dispose garbage in the pits. This is in line with the study by Odongkara (2009) on BMUs in Uganda which established the roles played by BMUs that include general cleanliness at the landing sites.

3.9The Influence of Disposing Garbage by Burning on Environmental Management of Mbita Beaches

The researcher cross-tabulated the predictor variable existence of sanitary facilities and disposal of garbage by burning so as determine environmental management at the beaches in Mbita District and the findings are shown in Table 3.11.

Table 3.11. Cross-Tabulation between Existence of Sanitary Facilities and Garbage Disposal through Burning

Garbage Disposal by Burning	Sanitary Facilities Exist					
	Yes		No		Unspecified	
	F	%	F	%	F	%
Yes	216	62.9	20	5.8	1	0.3
No	88	26.7	6	1.7	2	0.6
Not Specified	7	2.0	1	0.3	2	0.6

From Table 3.11, the study found that out of 343 respondents, majority of BMU members in beaches of Mbita District 216(63.0%) admits existence of sanitary facilities at their beaches and dispose garbage by burning, 88 (25.7%) respondents admits existence of sanitary facilities but do not dispose garbage by burning which implies that a significant number of BMU members burn their garbage for disposal as opposed to other methods. A number, 20(5.8%) specified that even though sanitary facilities did not exist at their beaches, they disposed garbage by burning it. 10(2.9%) of the respondents did not specify how they disposed of their garbage. This confirms the study of Odonkara (2009) on roles of BMUs in Uganda that they have improved sanitation in their beaches.

4.0 Summary of Results, Conclusions and Recommendations

4.1Findings

The influence of co-management on environmental management was also examined by the study. The factors which were tested were availability of sanitary facilities at the beach, availability of fish *banda* at the beach, frequency of cleaning the *banda*, availability of fish drying racks and means of garbage disposal in beaches of Mbita district. The study findings indicated that 311 (90.7%) of the respondents were having sanitary facilities at their beaches. The study data indicated that the kind of sanitary facilities available were 2-door latrines 145 (42.3%) and 4 door latrines 122 (35.6%). The respondents also specified that other sanitary facilities available at the beaches at 31 (9.0%). Further the study learnt that respondents 269 (78.4%) have fish *bandas* at their beaches and consequently, 240 (92.3%) clean them every day. However, 69 (20.1%) of the respondents do not have fish *bandas* in their beaches. The study also established that 246 (71.7%) of beaches do not have fish drying racks implying that hygiene standards are comprised.

4.2Conclusion

Improved environmental management at the beaches in Mbita district as a result of co-management was evaluated based on the following factors; availability of sanitary facilities at the beach, availability of fish *banda* (fish auction center), frequency of cleaning the fish *banda* and the means of garbage disposal. The studies showed that majority of beaches in the district have sanitary facilities and a constructed fish *banda*. When asked how often they cleaned their *bandas*, majority of the respondents indicated daily. Furthermore, the study found out that many beaches in the district do not have fish drying racks which means that they dry their fish on the ground indicating a compromise on environmental management. Finally the study revealed that majority of BMU members did not dispose garbage in the lake.

4.3Recommendation

In environmental management along the beaches, all key agencies of government such as National Environmental Management Authority, local authorities and relevant government ministries should harmonize the policy on waste management to curb pollution in the lake around the beaches of Lake Victoria. The ministry of local government should particularly channel parts of its devolved funds to construct sanitary facilities at the beaches including fish drying racks that are significantly lacking at the many beaches.

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