

# Strengthening one health: lessons learned of rabies response in Indonesia

*Tanrypada Thursina*<sup>1\*</sup>, *Mubasysyir Hasanbasri*<sup>2</sup> and *Yodi Mahendradhata*<sup>1</sup>

<sup>1</sup> Departement of Health Policy and Management, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

<sup>2</sup> Department of Biostatistic, Epidemiology, and Public Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

**Abstract.** In recent years, zoonoses have continued to pose a threat to global health, including in Indonesia. Avian influenza infections, rabies cases that remain endemic in many regions, and the COVID-19 pandemic are concrete examples of the dangers of zoonoses. These health issues can be prevented and addressed through the cross-sectoral collaboration for the One Health concept. The One Health concept emphasizes the interconnection between the health sector, animal health, and the environmental sector. One Health concept also promotes essential cross-sectoral collaboration in preventing and controlling zoonoses. As a concept that emphasizes various sectors to address the complex issue of zoonoses, it significantly aids in the rapid and accurate response to case reports and outbreak investigations. However, many health and veterinary health workers are unaware of or do not understand this concept. The lack of knowledge among these workers about the One Health concept can be problematic in managing zoonotic cases in the future, especially given the changing epidemiology of many zoonotic diseases. Despite cross-sectoral collaboration, the absence of the One Health approach results in fragmented and uncoordinated responses to zoonotic case reports, making handling less effective and proactive. Therefore, it is necessary to systematically introduce this concept to health and veterinary health workers through integrated and sustainable educational programs. Education about One Health enhances the skills and capacity of health and veterinary health workers and strengthens the national health system. It also can help to initiate collaboration between the two sectors in a sustainable manner to manage and control zoonotic disease and bridging the gap between them. This collaboration will enable better coordinated and integrated responses to zoonotic threats, ultimately improving the overall efficacy of disease prevention and control programs. Comprehensive introduction and training on One Health must become a priority to ensure that zoonoses do not continue developing and threaten public health in Indonesia.

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\*Corresponding author : [tanrypada@gmail.com](mailto:tanrypada@gmail.com)

## 1 Introduction

Zoonoses are diseases that spread from animals to humans. In recent years, based on data from the World Health Organization (WHO), it is estimated that there have been one billion cases of disease and millions of deaths due to zoonoses worldwide. Globally, 60% of reported cases of new infectious diseases (EID) and re-emerging infectious diseases (REID) are said to be zoonoses, with more than 30 new pathogens discovered in humans and 75% of them originating from animals [1]. Avian influenza virus infections a few years ago in many Asian countries, rabies that is still endemic and posing a health problem in many places, cases of SARS, MERS, and Ebola that a couple of years ago became a health issue in many countries, especially in Asia and Africa. Recently, the COVID-19 pandemic has been an example of zoonosis cases that can significantly threaten global health. Every year, the number of zoonotic transmission cases and deaths reported, therefore, shows an increase [2]. This indicates that zoonotic diseases have great potential to become epidemics again in the world.

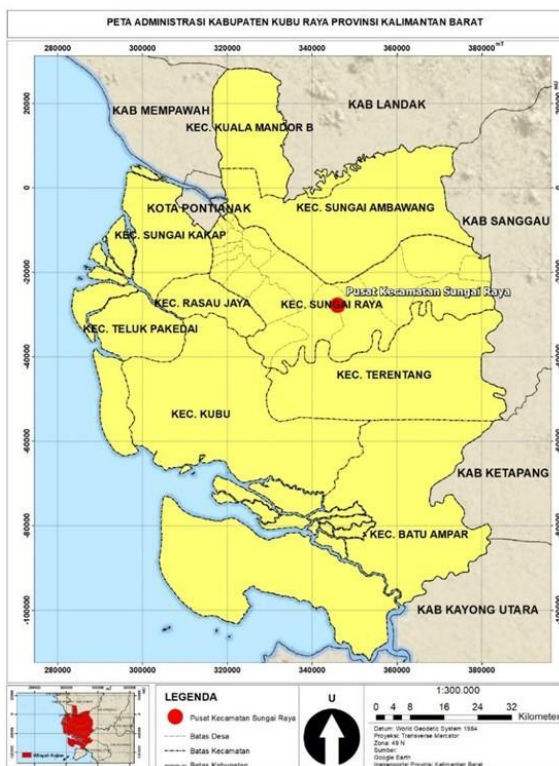
Climate change, environmental degradation, uncontrolled globalization, and the increasing interactions between animals and humans have become risk factors for the rising transmission of zoonoses. Most of the modern epidemics occurring today are caused by zoonotic viral pathogens due to these microorganisms' ability to quickly transfer from animal hosts, whether wild or domesticated, to humans through various human activities closely associated with animals such as hunting, deforestation, and intensive livestock farming [2]. Previous zoonotic outbreaks, such as SARS, Ebola, and COVID-19, have demonstrated how rapidly zoonotic diseases can spread, not only posing serious health risks but also becoming threats and having significant impacts on political stability and causing substantial economic losses for many countries. The SARS outbreak in Asia and the RVF (Rift Valley Fever) outbreak in Africa serve as examples of this, where these zoonotic disease outbreaks resulted in a decline in income for affected countries due to decreased economic activity, including in the tourism sector [1]. It is estimated that at least 3.3 million people will die each year from viral zoonotic diseases, with potential economic losses reaching 350 million to 210 billion dollars. This estimated number is based on the death rate that occurs in humans due to a new viral zoonotic disease that emerged in 1918 and caused the death of at least ten people [3]. This number could increase if preventive measures against the risk of the spread of zoonotic diseases are not taken.

Zoonosis is a disease that requires cross-sectoral efforts with a holistic approach to prevent and address it. In this regard, collaboration between various sectors, particularly the human, animal, and environmental health sectors, is essential through implementing the One Health concept. This concept emphasizes the integration of these three sectors, focusing on control efforts after cases occur and prevention and risk mitigation through effective cross-sector collaboration. In addition to communication, collaboration, and coordination, which are key activities within the One Health concept, capacity building is crucial for rapidly responding to zoonotic cases. Education and training that involve the human health, animal health, and environmental sectors within the framework of the One Health concept are vital to ensure that public health and animal health workforces have the necessary knowledge and skills to tackle zoonotic diseases effectively. However, nowadays, many public health and animal health workforces are still unaware of or lack understanding of the One Health concept, and capacity-building activities remain unintegrated between sectors as they still carry out the capacity-building internally. This situation occurs in many places in Indonesia, including in managing and controlling rabies in Kubu Raya Regency. The introduction and implementation of the One Health concept in capacity-building activities are crucial to helping create a more integrated and proactive response and are necessary to strengthen global health resilience in the future.

This research aims to identify the supporting and inhibiting factors in cross-sectoral collaboration in One Health, particularly in capacity-building activities for managing and controlling rabies in Kubu Raya Regency. The primary focus of this study is to evaluate the capacity building activities between sectors in the implementation of cross-sectoral collaboration, with special attention to introducing the One Health concept and its implementation in the region.

## 2 Methods

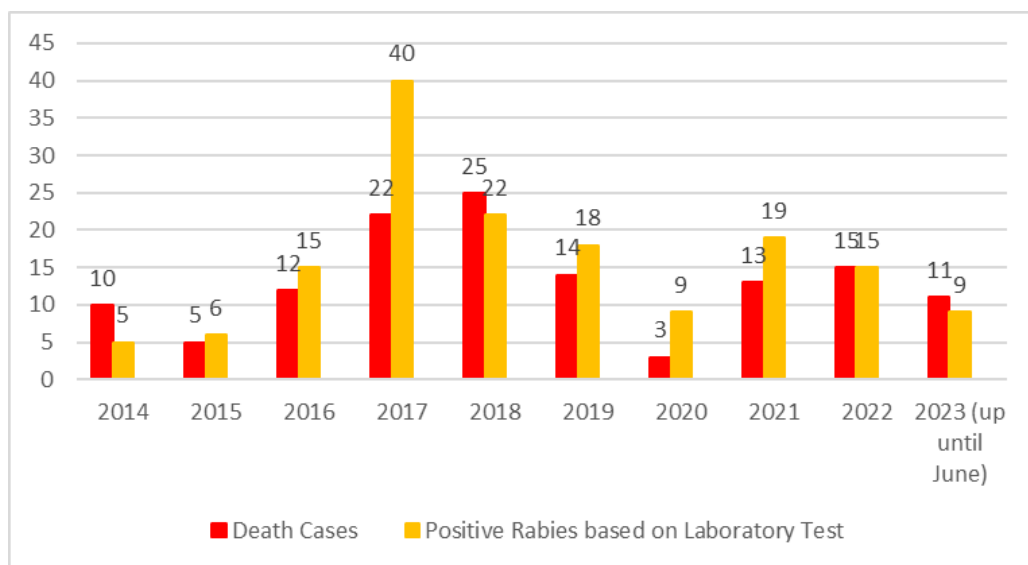
This research used a qualitative descriptive study with an evaluation method and a case study approach with an embedded single case design. The use of a case study approach in this research was carried out because a case study is an approach that focuses on the occurrence of a phenomenon in a real context [4]. This research explored cross-sector collaboration in dealing with rabies issues, especially in handling and controlling rabies, which mainly focuses on capacity-building efforts between the health and animal health sectors in Kubu Raya Regency. This research uses secondary and primary data obtained through in-depth interviews with 24 informants from the health sector, representatives from the Health District Office and Primary Healthcare, and representatives from the animal health sector through representatives from the Plantation and Livestock District Office. The secondary data was obtained through Kalimantan Barat Province and Kubu Raya Regency archives.



**Fig. 1.** Administrative map of Kubu Raya Regency

### 3 Results and Discussion

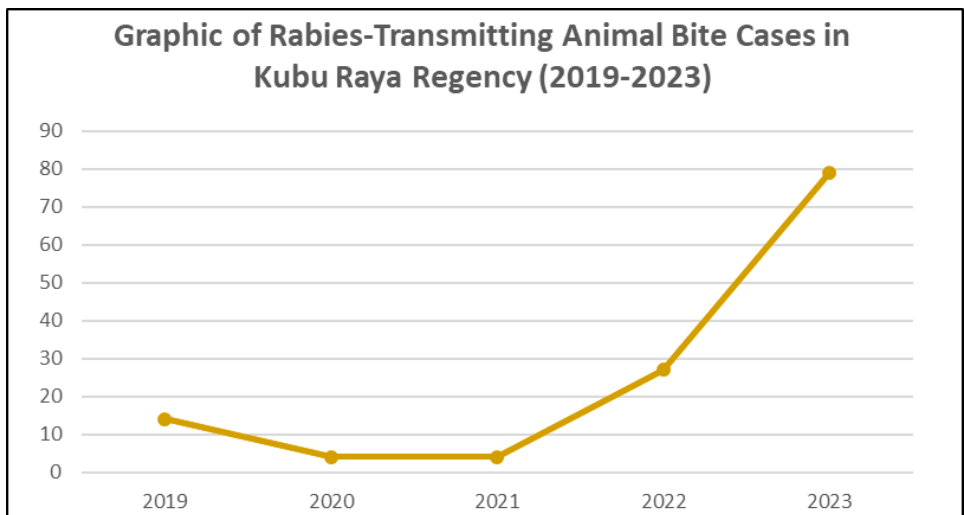
Rabies is a priority zoonotic disease in Indonesia. To this day, 26 provinces in Indonesia are still considered endemic for rabies. Kalimantan Barat is one of the provinces in Indonesia that is endemic for rabies and is among the five provinces with the highest death rates due to rabies. Out of the 14 regencies and cities in Kalimantan Barat, only Pontianak City remains rabies-free. At the same time, positive rabies cases have been reported in 13 other regions in recent years, including Kubu Raya Regency. According to data from the Plantation and Livestock Province Office of Kalimantan Barat, from 2014 to 2022, there were approximately 19,691 cases of animal bites in human, with 144 laboratory-confirmed positive rabies samples in animals, and 112 confirmed human deaths due to rabies (lyssavirus). In 2023, up until June, approximately 1,997 cases of animal bites in humans were reported, and almost all the cases caused by dogs, with 11 human deaths due to rabies, have been reported.



**Fig. 2.** Graphic of rabies-related deaths and laboratory-confirmed positive rabies cases in Kalimantan Barat from 2014-2023 (up to June) (Source: Plantation and Livestock Province Office of Kalimantan Barat)

Based on data, in 2023, all areas in Kalimantan Barat have reported cases of animal bites in humans, with deaths occurring in two districts. Meanwhile, laboratory tests on animals with positive rabies results were found in five districts.

Kubu Raya Regency is one of the areas in Kalimantan Barat Province that has reported rabies cases. This regency has a large area and is directly adjacent to other regencies with high positive rabies cases and deaths. Kubu Raya Regency is an urban hinterland area, which is closely related to the risk of rabies due to factors such as low population density, making monitoring of pets difficult, and limited access to healthcare, making it hard for the community to receive rabies treatment and low public awareness of rabies. In recent years, the number of animal bites potentially transmitting rabies cases in humans in Kubu Raya Regency has been reported to have significantly increased, especially over the last five years (2019-2023). This can be observed in the following case report graphic below:



**Fig. 3.** Graphic of rabies-transmitting animal bite cases in Kubu Raya Regency (2019-2023)

The increasing number of animal bite cases with the potential to transmit rabies in Kubu Raya Regency in recent years indicates that this disease has become a significant health threat to the community in the region. This is a major concern for relevant parties, as rabies is fatal if not treated promptly. The increase in animal bites cases can be attributed to various factors that should be addressed through collaborative efforts by sectors tasked with disease prevention and control. However, up to this point, the cross-sectoral collaboration in handling rabies in Kubu Raya Regency has not yet encompassed integrated capacity-building or the introduction of the One Health concept, which could be implemented to manage zoonotic diseases, including rabies.

**Table 1.** Distribution of deaths, rabies laboratory test results in animals, animal bite cases, and animal vaccinations for 2023 up to June (Source: Plantation and Livestock Province Office of Kalimantan Barat)

No	Regency	Death	Positive Rabies in Animal (Confirmed by Laboratory Test)	Animal Bites in Human Cases	Vaccinated Animals
1.	Sintang	8	2	306	2948
2.	Landak	3	2	447	1770
3.	Sekadau	-	2	219	447
4.	Malawi	-	2	45	-
5.	Singkawang	-	1	93	-
6.	Sanggau	-	-	284	-
7.	Bengkayang	-	-	204	290
8.	Ketapang	-	-	170	-
9.	Pontianak	-	-	48	75
10.	Kapuas Hulu	-	-	40	-
11.	Mempawah	-	-	37	1000
12.	Sambas	-	-	31	-
13.	Kubu Raya	-	-	18	-
14.	Kayong Utara	-	-	9	-

## **2.1 Introduction of One Health Concept to Workforces:**

One of the crucial actions in preventing and controlling zoonotic diseases is cross-sector collaboration involving various fields. The application of cross-sector collaboration is emphasized on the One Health concept, which is a collaborative, multi-sectoral, trans-disciplinary approach that operates at various levels, from local to global, which aims to achieve optimal health for all, where the success of implementing this concept is very dependent on communication, collaboration, coordination, and capacity-building [5,6]. One Health concept deals with zoonoses; common activities include integrated surveillance between sectors, optimizing laboratory capacity, emergency preparation and rapid response systems, forming labor and technical groups, preventing and handling priority zoonotic diseases, and effective communication [7]. Unfortunately, One Health addressing zoonoses has not been widely implemented in Indonesia. One of these things happened in Kubu Raya Regency, part of Kalimantan Barat Province.

Although the collaboration between the Health District Office and the Plantation and Livestock District Office, as the two main sectors in handling zoonotic disease in Kubu Raya Regency, has gone quite well in providing a quick response to zoonotic case reports in the community, the communication and the coordination between the two sectors involved generally only occurs when a report of a rabies-transmitting animal bite is found within the community. The increase in cases highlights the need to find effective prevention strategies to address this issue. One of the factors contributing to the difficulty in managing this problem is the lack of collaboration among the health sector and veterinary sector and the minimal involvement of the environmental health sector. The inability of these sectors to work together effectively can lead to a potential rise in zoonotic cases, which also impacts economic losses.

Even though health communication is a well-recognized discipline in human health, it is not yet being applied in cross-sector collaboration with other sectors to apply the One Health concept. This is a potentially wasted opportunity for building bridges between human health, animal health, environmental health, and other social sciences, addressing cross-cutting issues such as zoonotic [8]. To implement the One Health concept effectively, holding regular meetings or forums between sectors and establishing shared goals is important. Regular sector meetings allow parties from human health, animal health, and environmental sectors to understand each other's work cultures, share relevant information, and discuss challenges directly. This creates a platform for open communication and better coordination. Open communication can shape the perspective of mutual understanding and building trust between sectors [9,10]. Open communication also strengthens the importance of integrated communication between the sectors involved. One communication allows communication in several ways, using different channels and reaching different contexts and populations [8].

**Table 2.** Interview results with informants

Quotation	Theme
“There hasn’t been any joint capacity building. We have our own training, but there were two sessions from the department, if I’m not mistaken. But it wasn’t really training. It was more like socialization, just socialization.” <b>(Informant 1)</b>	No Integrated capacity building
“There hasn’t been any joint capacity building. No joint surveillance training either, especially not for rabies.” <b>(Informant 2)</b>	
“There hasn’t been any cross-sectoral capacity building. None. No.” <b>(Informant 6)</b>	
“There hasn’t been any joint cross-sectoral capacity building. Since I’ve been in charge, there hasn’t been any.” <b>(Informant 7)</b>	
“So far, there haven’t been any training sessions. But when it comes to coordination, there is communication between program holders during meetings and such.” <b>(Informant 8)</b>	
“For now, regarding capacity building, perhaps because rabies is considered one of the neglected diseases, there’s no specific budget allocated for it.” <b>(Informant 3)</b>	Lack of budget
“Since I’ve been here, it’s only been about handling rabies, like administering vaccinations in the field and providing education about diseases that can spread to humans. As for One Health, there hasn’t been anything yet.” <b>(Informant 2)</b>	No introduction of One Health Concept Training Experience
“There was a training for integrated surveillance in the past. But for One Health, nothing yet.” <b>(Informant 4)</b>	
“The last time there was training for rabies vaccinators (within the Plantation and Animal Husbandry Department). Even trained Babinkamtibnas, so the police, to help out.” <b>(Informant 5)</b>	Training experience

Additionally, setting shared goals ensures that each sector works towards the same objectives, enhancing commitment and synergistic collaboration. By establishing goals that require contributions from all parties, every sector feels involved and accountable for achieving the desired outcomes, thus facilitating a more effective and harmonious implementation of One health. The failure to collaborate between sectors can also bring significant economic losses and overlook the potential for reducing zoonotic disease impacts if a One Health approach is implemented. This issue is further exacerbated by differing work climates among the sectors, leading to inadequate communication and coordination platforms and mechanisms among the parties involved in zoonosis prevention and control, including rabies. Without integrated collaborative efforts, the sectors that should complement each other may work in isolation, thereby preventing and managing zoonotic disease.

## **2.2 Integrated Capacity Building**

Capacity-building is one of the crucial activities supporting cross-sector collaboration in handling and controlling zoonotic diseases. This capacity-building activity refers to increasing the skills, resources, infrastructure, and knowledge needed. Integrated capacity-building between sectors is an important component of activities in the One Health concept to prevent, detect, and respond to health threats, especially zoonotic diseases. Capacity-building is also crucial in global health, focusing on utilizing resources and sustainable efforts to improve skills, abilities, and organizational capacity, especially in developing countries [11]. Capacity-building can be implemented locally and globally, greatly impacting the handling of zoonoses and encouraging the strengthening of cross-sector cooperation through communication and collaboration. Capacity building is also needed among stakeholders in the human health and animal health sector so it can improve the treatment outcomes and help to understand the dimensions of human, animal, and environmental health that are needed not only to deal with cases of zoonotic diseases but also for other diseases [12,13].

However, there is still no integrated capacity-building between the Health District Office and the Plantation and Livestock District Office of Kubu Raya Regency. The human and animal health sectors in Kubu Raya Regency are still focused on strengthening their internal capacities, including efforts to handle rabies. To increase the knowledge and abilities of workforces in handling zoonotic cases, especially rabies, these two institutions are still conducting internal training. Integrated surveillance training was held, but it was never carried out again. The surveillance training for handling zoonoses was again carried out internally, especially from the regional departments at the provincial level.

There are several priority areas in capacity-building efforts which cover various important aspects. Providing and sharing knowledge, skills, and experience related to epidemiological surveillance for zoonoses, both emerging and re-emerging, including improving early warning and response [14]. Improving zoonotic surveillance through training is important for public and animal health workers. The reason is related to the changes in epidemiological patterns of diseases, which increase the complexity of zoonotic diseases, where collaboration between professionals from various sectors, especially the human health and animal health sectors, is to face this challenge [15]. Another specific objective is to develop the capacity of officers to detect and report zoonotic incidents, whether occurring in humans or animals, by established international standards, as well as to prevent and control foodborne disease. In addition, it is also important to build and promote horizontal communication and cross-sector partnerships through knowledge, identify key priority activities together, and prioritize cross-sector collaboration, as well as introduce innovative technologies and concepts that are important for cross-sector information exchange [14].

## **2.3 Barriers to One Health Implementation**

Budget constraints are cited for the absence of integrated capacity-building and the lack of One Health implementation in Kubu Raya Regency. The lack of budget for One Health and executing integrated and coordinated capacity-building efforts is common in many places. Funding is a crucial element in the execution of capacity-building. However, it is often absent due to budgetary shortages caused by miscalculations and disproportionate allocation of funds across sectors. Funding is frequently cited as a challenge in One Health, as limited funds are often found, especially in the environmental and agricultural sectors, making it difficult to promote cross-sector collaboration where financial costs are involved [16,17]. The lack of budget not only delays the implementation of One health but also hinders the overall



preparedness to manage and control zoonotic disease, especially in developing areas such as Kubu Raya, which in recent years has faced the problem of increasing cases of rabies-transmitting animal bites on human. Lack of budgeting mainly occurs in efforts to deal with neglected zoonotic diseases. Neglected zoonotic diseases continue to have a significant impact, particularly on people with low incomes, who are often the victims. However, the attention and funding given to this group of zoonoses is far less than that of new zoonotic diseases or those classified as New Emerging Infectious Diseases. Most neglected zoonotic diseases, such as rabies, anthrax, brucellosis, bovine tuberculosis, and trypanosomiasis, are transmitted by domestic animals, although some are related to wild animals [13]. This is also the case in Kubu Raya Regency, where the handling and control of rabies is still lacking in funding to facilitate cross-sectoral collaboration, including for conducting integrated training and capacity-building among the sectors involved.

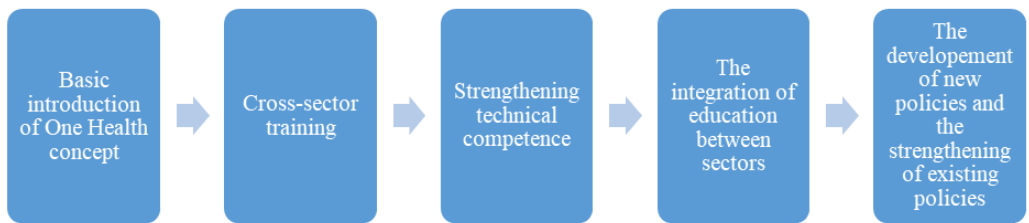
One Health implementation requires financial investment, which many countries are not yet willing to make, even though applying this concept provides long-term benefits, and initial investments can save significant costs and lives in the future. An analysis by the World Bank suggests that global One Health investments through public health and veterinary services could save up to 30 billion dollars annually in responding to and treating zoonotic diseases worldwide. One Health concept represents a broad preventive, preparedness, and response effort to pandemics, recognized as a critical part of managing public health emergencies. This emphasizes that One Health funding mechanisms must encourage a multi-sectoral approach and overcome existing barriers to operationalization, as the costs of responding to and managing events after reported cases of zoonoses are much more expensive than funding for preventive measures [18,19].

Besides funding issues, another obstacle encountered in One Health, which complicates the execution of integrated capacity-building, is the weak political support and governance [19]. Successful implementation of the One Health concept indeed requires government involvement and political support, particularly in the form of budgeting and incentives, as well as the need for funding to be restructured to support the operation of collaborative efforts across sectors [11] [17,20]. The involvement of stakeholders as actors in providing political support for One Health is an important key, where stakeholders can make the necessary decisions and policies and be responsible and actively involved in them [16]. Without political support from the government through policies or regulations, one health would be challenging. This is especially important to address the operational issues required in implementation. Therefore, policies and political support are necessary to provide good opportunities for One Health implementation. The policies made and decided upon should be evidence-based (evidence-based policy), particularly about zoonotic disease management based on the One Health approach to addressing public health challenges, thereby providing a comprehensive view of the opportunities to overcome and prevent zoonotic outbreaks [17,21].

## **2.2 Building One Health Competency**

Implementing One Health and executing integrated capacity-building requires well-planned steps. The crucial first step is introducing the basic concept to health and veterinary workforces. This can be done through cross-sectoral and interdisciplinary training to strengthen each party's technical competencies. Therefore, it is necessary to integrate One Health education into a formal education curriculum to ensure that public health and veterinary health professionals consistently understand the relationship between human health, animal health, and environmental health.

In the One Health approach, the introduction and training need to be conducted not only at the individual level but also at the institutional level. Practical and clinical training programs through case studies and case simulations with collaborative solutions should be carried out and can serve as effective tools for field implementation. Conducting routine workshops related to One health is a way to achieve this. Efforts to incorporate One Health teachings into formal education curricula and train future stakeholders, such as doctors, veterinarians, public health workforces, and veterinary workforces, are ways to raise awareness and introduce the One Health concept. Future stakeholders need to be trained within a framework of this concept and gain a deeper understanding of One health through case studies and by providing examples of cases that have demonstrated its implementation's effectiveness, efficiency, and potential. Mapping is an important step in introducing and implementing One Health, especially in creating a competent workforce ready to face zoonoses that threaten human, animal, and environmental health, becoming a global health issue. The mapping process in this context includes analysis of opportunities, resources, and curriculum at the global, regional, and national levels, establishing and developing a competency framework, developing technology that supports the workforce, explanation of job descriptions for One Health professionals, and is equipped with monitoring and evaluation [18,22]. These steps are crucial to ensuring that the training and education provided to the workforce, who are potential stakeholders, align with the needs in the field and can address the evolving challenges in the efforts to manage and control zoonotic diseases and other health issues related to the One Health concept.



**Fig.4.** Schematic steps for the introduction and implementation of one health for the management and control of zoonoses

Building a competent workforce using the One Health approach is closely related to the Resource Dependence Theory (RDT), which states that an organization operates within a broad environment and depends on external resources. The organization's environment encompasses all structures, actors, and events that influence the organization's dependence on external resources. This environment gives opportunities to acquire labor, facilities, and necessary equipment [23]. In the healthcare system, this theory is highly influential in assessing how the organizational environment shapes strategies for resource access, including the need for qualified personnel. This is especially relevant when a healthcare organization faces uncertainty in its environment; then, it will direct strategies to secure the additional resources needed [24]. In developing a workforce capacity that understands and applies the One Health concept approach, various resources, relevant curricula, and supporting technologies are necessary. The mapping process required resources that align with Resource Dependence Theory, which emphasizes identifying and managing dependencies on external resources. Cross-sector collaboration is the core of the One Health concept, which reflects RDT and highlights the interdependence between organizations. This interdependence in the application of One Health can also be leveraged to enhance efficiency in training and meet the need for a workforce with

the knowledge and skills to implement this concept. This is crucial in managing and controlling zoonotic diseases, where collaboration and cross-disciplinary integration are keys to success.

Other options that can be implemented to introduce and implement One health are through the creation of guideline modules and standard protocols, strengthening collaboration with One Health professional organizations, and involving the community to strengthen and disseminate the knowledge and skills needed to effectively address zoonotic threats, for example by organizing activities on commemorative days like Rabies Day. Effective implementation of One Health programs can only be successful by embedding political commitment, policy formulation, sustainable financing, program development, knowledge sharing, institutional collaboration, capacity enhancement, engagement of civil society, and active participation of the communities. There is also a need to design and conduct advocacy engagements with political leaders at national, sub-national, and community levels regarding the benefit of One health. In addition, increased mobilization of external assistance and engagement of private sector, NGO, and civil society organizations through greater public-private partnership is required to support One Health activities, given that zoonotic diseases that can cause epidemics/pandemics can affect any sector [20,25]. One health is a movement initiated by international organizations but often neglects the role of civil society organizations or communities. It is important to enhance civil society involvement [26]. Involving community members can be the key to successfully introducing the One Health concept. This is because communities possess knowledge about their surrounding environment, making them strategic partners in maintaining the health of humans, animals, and the environment. In Kubu Raya Regency, there is active involvement from the animal lover community in rabies prevention efforts through the vaccination of rabies-transmitting animals and educational activities to increase public awareness, particularly among pet owners of rabies-transmitting animals, about the dangers of rabies and effective prevention methods of this disease.

Active community participation in various activities that support efforts to prevent and control zoonoses, such as disseminating information that can change people's bad behavior regarding health, can have a significant impact. Being involved in One Health will positively impact and ensure sustainable implementation. Thus, strong partnerships between government, society, and various other sectors are an important foundation for building a more resilient health system that can face global health challenges. This approach will also strengthen the connections between policymakers, funders, and local communities, ensuring that One Health effectively addresses relevant health issues, sustains political momentum, and encourages long-term investment in operationalizing One Health [26].

These steps to introduce and implement the One Health concept, supported by strong funding and policies, can significantly enhance the capacity of the public health and veterinary workforces and other personnel working to address zoonoses. They can also improve the effectiveness of cross-sector collaboration in handling zoonoses as a global health challenge.

## **4 Conclusion**

The implementation of the One Health concept in the handling and controlling of zoonosis disease is crucial. The success of controlling zoonotic diseases heavily depends on cross-sector collaboration and the integration of education and training that focuses on the One Health concept for public health and animal health workforces handling zoonoses. Supporting resources to build the workforce's capacity, such as relevant One Health educational curriculum and technology, is important for developing competent human resources to carry out their duties and responsibilities. This effort is also supported by mapping resources and establishing a competency framework, which are key elements in One Health, which aims to ensure that all

the workforces are prepared to face the challenges caused by zoonotic disease and support global health.

To effectively address zoonotic threats, it is crucial to implement policies that advocate for the adoption of the One Health concept. This approach integrates public, veterinary, and environmental health efforts through comprehensive workforce training programs focused on early detection, case reporting, and zoonotic disease management. Establishing cross-sector communication forums is essential for coordinating actions among relevant agencies, ensuring unified protocols that adhere to both national and international standards. Additionally, mapping resources in each sector helps identify needs and limitations, enhancing collaboration. Leveraging technologies like Geographic Information Systems (GIS) can facilitate the identification of high-risk areas and the allocation of health resources, improving the efficiency and targeting of responses. Continuous monitoring and evaluation systems are necessary to assess the effectiveness of One Health programs and make adjustments for future improvements.

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