

## COMMUNITY CAPACITY IN DEALING WITH DROUGHT IN INSANA BARAT DISTRICT, NORTH CENTRAL TIMOR, EAST NUSA TENGGARA

Maria Serlince Sanit<sup>1</sup>, Turniningtyas Ayu Rachmawati<sup>2</sup>, Nailah Firdausiyah<sup>2</sup>

<sup>1</sup>Magister Program in Urban and Regional Planning, Brawijaya University, Jl. MT. Haryono No.167, Dinoyo, Lowokwaru, Malang City, East Java 65145

[serlincesanit@gmail.com](mailto:serlincesanit@gmail.com)

<sup>2</sup>Department of Urban and Regional Planning, Faculty of Engineering, Brawijaya University, Jl. MT. Haryono No.167, Dinoyo, Lowokwaru, Malang City, East Java 65145

**ABSTRACT:** *Insana Barat Subdistrict is an area in North Central Timor Regency which is vulnerable to the dry season every year and experiences a water deficit. To reduce the risk of drought, community preparedness needs to be improved through the provision of water to deal with drought. Several efforts have been made by the government and the community to cope with drought, including the construction of dams, distribution of clean water fiber, and the existence of cropping patterns in agriculture. This study aims to determine the capacity of the people of Insana Barat District in dealing with drought. The role of the community becomes very important because in fact the community and local organizations are the key in disaster risk reduction initiatives. The method used in this research is quantitative with a survey in Insana Barat District with 335 respondents spread over each village. Determination of respondents in this study was done randomly. The analysis technique used is scoring and capacity calculation using the asset pentagon on the variables of human assets, social assets, natural assets, physical assets and financial/financial assets. The results showed that the people in Usapinonot Village, Unini Village, Letneo Village, Banae Village, Nifunenas Village, Subun Tualele Village, Subun Bestobe Village belonged to low capacity, Subun Village, Lapeom Village, Atmen Village and South Letneo Village were classified as medium capacity. and Oabikasi Village is included in the high classification.*

**Keyword :** *Capacity, Drought, pentagon asset*

### 1. INTRODUCTION

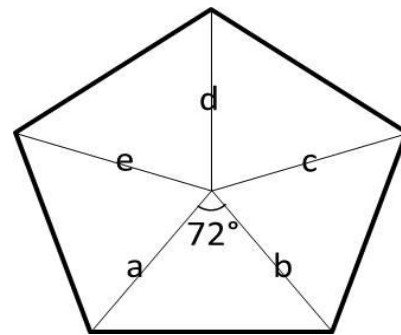
Climate change and its impact on people's livelihoods is one of the challenges facing human society. The impact of human activities such as settlements, urban development, and excessive use of natural resources on the environment is recognized as increasing the frequency and severity of natural disasters (Shen et al., 2009). Natural disasters as a recurring phenomenon in the absence of a declining system can be catastrophic and have devastating effects and consequences (Wang et al., 2020). Drought is one of the natural disasters caused by climate change. Drought is a slow, spatially extensive event that can affect an area for weeks, months, or years (Jenkins et al., 2021) and impact on livelihoods and cause massive economic and ecological damage every year (Elkouk et al., 2022). Livelihood assets are critical for survival and for responding to environmental shocks and decisively building household livelihood resilience across drought-affected areas. The creation of livelihood assets is recognized as a key strategy for building community immunity to repeated shocks and resulting in improved community livelihoods (Nasrnia & Ashktorab, 2021).

In this study, the community-centred approach is emphasized based on the five components of the sustainable livelihoods approach, namely human, social, natural, physical, and financial capital, which are interdependent, and each can complement other assets. Human capital is an intrinsic and acquired asset of an individual which consists of a person's skills, abilities and abilities (Quandt, 2018). This notion refers to the skills, good health, and ability to work that enable

individuals to pursue different life strategies and activities to achieve their life goals (Shen et al., 2009). Economists define the concept of human capital as internal capabilities that are internalized or accumulated over the age range (work). Human capital includes social networks, group membership, reciprocity, and trust. In general, social capital in each group represents the level of trust in each other and solidarity in society. Social capital consists of networks, groups, associations, and relationships, trust, and interactions (Adger et al., 2005). These are the resources and capital that individuals and society can access through certain communications with each other. Social assets are defined as social resources that people use to earn a living. Natural capital consists of access to environmental services and resources (McClanahan et al., 2012). Natural capital is very important for those who make all or part of their livelihoods from natural resource-based activities (Sharafi et al., 2020). This capital involves resources and elements such as land, water, mines, livestock and other natural resources, for example, ownership of agricultural land, forests and grasslands, ownership of water and mineral industry, etc. Natural capital and vulnerability have a close relationship that does a lot of damage shocks to livelihoods such as fires, floods, earthquakes, etc. is a natural process that reduces natural capital (Kollmair & Gamper, 2002). Physical capital refers to access to services and infrastructure, skills, knowledge, education, health, and access to the family workforce (Nasrnia & Ashktorab, 2021). Moreover, it refers to various facilities that largely contribute to the local environment including housing, public places, industry, bridges, dams, ports, and shelters. In addition, it includes vital facilities, such as electricity, water, telephone and gas. Financial capital is defined as financial resources, such as cash, bank accounts, savings, income, investments, credit, current assets, pension rights, benefits, grants, remittances, household property, etc.

**2. METHOD**

The approach in this research is quantitative research. Quantitative data were mainly obtained from closed questions in the household survey questionnaire. The research uses simple random sampling method and uses Isaac Michael's technique with a sampling error rate in determining the number of samples, namely at an error rate of 5%, which means the smaller the error rate, the more valid it is. The research population is all villages in Insana Barat District with a total sample of 335 and divided into each village. With simple random sampling, all households in the study area have the same opportunity to be selected as respondents so that the distribution of the questionnaire is not patterned. Analysis using the asset pentagon can be done with the following equation:



**Figure 1 Area of the Pentagon**

**Figure 1.** Area of the Pentagon  

$$LPentagon = (1/2 ab. \sin 72^\circ) + (1/2 bc. \sin 72^\circ) + (1/2 cd. \sin 72^\circ) + (1/2 de. \sin 72^\circ) + (1/2 ea. \sin 72^\circ) \tag{1}$$

**Table 1 Capacity Research Variables**

Variable	Sub Variable	Parameter
Capacity	Human Capital	<ul style="list-style-type: none"> <li>• Education (knowledge about disasters)</li> <li>• Local culture</li> <li>• Number of adults (adult ratio) working in the family.</li> </ul>
	Natural Capital	<ul style="list-style-type: none"> <li>• Land ownership</li> <li>• Water sources</li> </ul>
	Physical Capital	<ul style="list-style-type: none"> <li>• Accessibility (distance from house to water)</li> </ul>

Variable	Sub Variable	Parameter
		source)
	Social Capital	• Vehicle ownership
		• Road conditions
		• Participation in community organizations
	Financial Capital	• Social network
		• Income/earnings
		• Livestock ownership
		• Savings holdings
		• Fund

human capital (Table 2). Table 3 are the results of the human capital scoring of villages in Insana Barat District. Insana Barat sub-district has low human resources, where the majority of families have an average of one person working. This happens because children in families who are eligible to work are unemployed. Education in this village is not very good because the average population is elementary and junior high school graduates. While high school or college graduates are still limited. Oabikase Village is included in the high classification. Oabikase village has a traditional ritual of "Toit Ulan", the community is believed to be able to bring rain and protect trees that are considered sacred trees and make the area a water recharge area to store water in the village that can be used as a source of clean water for the community during the dry season or rainy season.

### 3. RESULT AND DISCUSSION

#### 3.1 Human Capital

Education, local wisdom, and the number of working adults are parameters for assessing

**Table 2 Average value of human capital**

Village	Educational average	Average value of local wisdom	Average number of working adults
Subun	1,43	3,65	1,87
Lapeom	1,44	3,52	2,16
Usapinonot	1,42	3,54	2,04
Unini	1,55	3,55	1,89
Letneo	1,62	3,47	1,88
Banae	1,55	3,46	2,05
Atmen	1,48	3,33	2,24
Letneo Selatan	1,47	3,47	1,95
Nifunenas	1,5	3,61	2,28
Subun Tualele	1,71	3,43	1,95
Subun Bestobe	1,25	3,56	1,94
Oabikase	1,67	3,67	2,08

**Table 3 Human capital scoring**

Village	Educational score	Educational score	Average number of working adults score	Total Score	score	Human Capital Classification
Subun	1	2	1	4	1	Low
Lapeom	1	2	1	4	1	Low
Usapinonot	1	2	1	4	1	Low
Unini	1	2	1	4	1	Low
Letneo	1	2	1	4	1	Low

Village	Educational score	Educational score	Average number of working adults score	Total Score	score	Human Capital Classification
Banae	1	2	1	4	1	Low
Atmen	1	2	1	4	1	Low
Letneo Selatan	1	2	1	4	1	Low
Nifunenas	1	2	1	4	1	Low
Subun Tualele	1	2	1	4	1	Low
Subun Bestobe	1	2	1	4	1	Low
Oabikase	1	3	1	5	3	High
<b>Highest Data</b>		<b>5</b>		Low	1	4 -4,03
<b>Lowest Data</b>		<b>4</b>	<b>Scoring Class</b>	Moderate	2	4,04 - 4,07
<b>interval</b>		<b>0,3</b>		High	3	4,-08 - 5

### 3.2 Natural Capital

The indicators used in the assessment of natural capital are land ownership and the number of water sources in villages in Insana Barat District. If the community owns land or land, it is very possible that the community will be helped by the economy because they can use the land or land not only for their own production (agriculture) activities but can also be rented out. The available springs in Insana Barat District allow the community to get water directly from the springs. The majority of residents in Insana Barat Subdistrict own land or agricultural land and each village has at least one spring that does not experience drought during the Long dry season which can be used to fulfill the community's clean water (Table 4). Table 5 shows the average indicators and scores for natural capital in Insana Barat District with the classification of natural capital High being in South Letneo Village. The moderate classification in Banae Village, Atmen, Nifunenas and Subun Tualele Villages and other villages is included in the low classification.

**Table 4 Average value of natural capital**

Village	Average value of land ownership	Average value of water source
Subun	1,96	1
Lapeom	2,12	1,83
Usapinonot	1,96	1,67
Unini	2,32	2,28
Letneo	1,76	2
Banae	2,07	3
Atmen	2,12	3
Letneo Selatan	3,11	4,21

Nifunenas	1,94	2
Subun Tualele	1,67	3
Subun Bestobe	1,94	2
Oabikase	2,17	2

**Table 5 Human capital scoring**

Village	Land ownership score	Water source score	Total Score	Score	Human Capital Classification
Subun	1	1	2	1	Low
Lapeom	1	1	2	1	Low
Usapinonot	1	1	2	1	Low
Unini	1	1	2	1	Low
Letneo	1	1	2	1	Low
Banae	1	2	3	2	Moderate
Atmen	1	2	3	2	Moderate
Letneo Selatan	2	3	5	3	High
Nifunenas	1	1	2	2	Moderate
Subun Tualele	1	2	3	2	Moderate
Subun Bestobe	1	1	2	1	Low
Oabikase	1	1	2	1	Low
<b>Highest Data</b>	<b>5</b>		Low	1	2-3
<b>Lowest Data</b>	<b>2</b>	<b>Scoring Class</b>	Moderate	2	4
<b>Interval</b>	<b>1</b>		High	3	5

### 3.3 Physical Capital

Physical capital assessment uses 3 indicators, namely accessibility (distance from house to water source), vehicle ownership, and road conditions. In the dry season, the need for

clean water is met by buying or taking it to nearby villages with a distance of ± 2 km, therefore ownership of a motorized vehicle is very helpful in transporting clean water from surrounding villages without having to incur costs (Table 6). Table 7 is the average values of the physical capital scoring indicators which show that the village with the human capital classification High is Oabikase Village. Moderate classification is Subun Village, Lapeom, Usapinonot, Unini, Letneo and South Letneo Villages. Villages with low classification are Banae Village, Atmen, Nifunenas, Subun Tualele and Subun Bestobe Village.

**Table 6 Average value of physical capital**

Village	Accessibility rating	Average value of vehicle ownership	Average value of road conditions
Subun	3,43	1,22	2,61

Village	Accessibility rating	Average value of vehicle ownership	Average value of road conditions
Lapeom	3,6	1,14	2,36
Usapinonot	3,54	1,15	2,54
Unini	3,45	1,18	2,55
Letneo	3,56	1,15	2,38
Banae	1,45	1,19	2,46
Atmen	3,42	1,18	2,39
Letneo Selatan	4,58	1,16	2
Nifunenas	1,39	1,22	2,67
Subun Tualele	1,62	1,21	2,57
Subun Bestobe	3,56	1,22	2,31
Oabikase	3,67	1,27	2,5

**Table 7 Physical capital scoring**

Village	Accessibility score	Vehicle ownership score	Road condition score	Total Score	score	Human Capital Classification
Subun	2	1	2	5	2	Moderate
Lapeom	2	1	2	5	2	Moderate
Usapinonot	2	1	2	5	2	Moderate
Unini	2	1	2	5	2	Moderate
Letneo	2	1	2	5	2	Moderate
Banae	1	1	2	4	1	Low
Atmen	1	1	2	4	1	Low
Letneo Selatan	3	1	1	5	2	Moderate
Nifunenas	1	1	2	4	1	Low
Subun Tualele	1	1	2	4	1	Low
Subun Bestobe	2	1	1	4	1	Low
Oabikase	3	1	2	6	3	High
<b>Highest Data</b>		<b>6</b>		Low	1	4
<b>Lowest Data</b>		<b>4</b>		Moderate	2	5
<b>Interval</b>		<b>0,7</b>		High	3	6

### 3.4 Social Capital

Participation in community organizations and social networks is an indicator of social capital assessment in Insana Barat District. Table 8 and table 9 are the average values of indicators and results of Social capital scoring. The results of the scoring show that all villages in Insana District are included in the High

classification. Even though the villages in Insana Sub-district do not have a special disaster management organization, in every village there is a Village Correctional Institution for mutual cooperation and must be followed by the whole community. Communities in villages in Insana Sub-district have relatives and have good relations with residents from neighboring

villages who allow them to ask for economic assistance when a drought occurs.

**Table 8 Average value of social capital**

Nama Desa	Nilai rata-rata partisipasi dalam organisasi	Nilai rata-rata jaringan sosial
Subun	1,47	3,87
Lapeom	1,51	3,8
Usapinonot	1,5	3,96
Unini	1,49	3,81
Letneo	1,49	3,68
Banae	1,5	4,02
Atmen	1,5	4,24
Letneo Selatan	1,95	3,53
Nifunenas	1,5	4,22
Subun Tualele	1,39	4,1
Subun Bestobe	1,48	3,81
Oabikase	1,38	3,67

**Table 9 Social capital scoring**

Village	Organizational participation score	Social network score	Total Score	Score	Human Capital Classification
Subun	1	3	4	3	High
Lapeom	1	3	4	3	High
Usapinonot	1	3	4	3	High
Unini	1	3	4	3	High
Letneo	1	3	4	3	High
Banae	1	3	4	3	High
Atmen	1	3	4	3	High
Letneo Selatan	1	2	4	3	High
Nifunenas	1	3	4	3	High
Subun Tualele	1	3	4	3	High
Subun Bestobe	1	3	4	3	High
Oabikase	1	3	4	3	High

### 3.5 Financial Capital

The indicators used in the assessment of financial capital are income/income, livestock ownership, ownership of savings and assistance (Table 10) is the average value of the fund

capital indicator. The results of the scoring of capital funds in table 11 Subun Village, Lapeom, Atmen, Nifunenas, and Subun Bestobe Village are classified as High. Usapinonot Village, Unini Village, Letneo Village, Banae Village, South Letneo Village, Subun Tualele Village, Oabikase Ermausk Village are classified as low. The average population in Insana Subdistrict has an income ranging from > 1 million – 2 million rupiah per month, and does not have a special savings account used during a disaster.

The aid parameter shows that some people receive assistance from the government for the Family Hope Program and Direct Cash Assistance. Financial assistance in the event of a disaster can also be obtained by applying for a loan to a savings and loan cooperative on easy terms. The ownership of livestock affects the income of the population when a disaster occurs. Drought caused crop failure and people's incomes decreased. To meet the needs when income decreases, farmers can sell livestock products to meet basic needs. The different scoring results come from indicators of livestock ownership, where the people of Insana Subdistrict all have livestock in the form of chickens but not all people have cattle, goats, horses and pigs.

**Table 10 Average value of financial capital**

Village	Average Earnings	Average value of livestock ownership	Average value of savings holding	Average score of help
Subun	1,52	2,34	1	3,37
Lapeom	1,56	2,48	1	3,42
Usapinonot	1,46	2,29	1	3,52
Unini	1,62	2,31	1	3,4
Letneo	1,41	2,15	1	3,44
Banae	1,55	2,17	1	3,49
Atmen	1,7	2,34	1	3,41
Letneo Selatan	2	2,66	1	3,26
Nifunenas	1,56	2,35	1	3,56
Subun Tualele	1,48	2,27	1	3,45
Subun Bestobe	1,44	2,39	1	3,41
Oabikase	1,42	2,08	1	3,58

**Table 11 Financial capital scoring**

Village	Earnings Score	Livestock ownership score	Savings holding score	Fund score	Total Score	Score	Fund Capital Classification
Subun	1	2	1	2	6	3	High
Lapeom	1	2	1	2	6	3	High
Usapinot	1	1	1	2	5	1	Low
Unini	1	1	1	2	5	1	Low
Letneo	1	1	1	2	5	1	Low
Banae	1	1	1	2	5	1	Low
Atmen	1	2	1	2	6	3	High
Letneo Selatan	1	2	1	1	5	1	Low
Nifunenas	1	2	1	2	6	3	High
Subun Tualele	1	1	1	2	5	1	Low
Subun Bestobe	1	2	1	2	6	3	High
Oabikase	1	1	1	2	5	1	Low
<b>Highest Data</b>			<b>6</b>		Low	1	5 -5,03
<b>Lowest Data</b>			<b>5</b>	<b>Scoring Class</b>	Moderate	2	5,04 - 5,07
<b>Interval</b>			<b>0,3</b>		High	3	5,08 - 6

### 3.6 Pentagon Asset Capacity of Insana Barat District Community

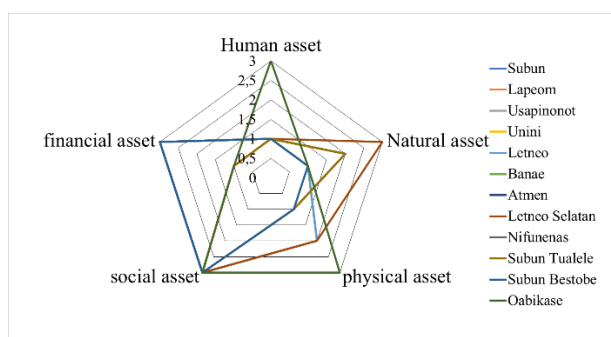
**Table 12** and **Figure 1** are table of community capacity classification, the area of the pentagon with the classification of Usapinot Village, Unini, Letneo, Banae, Nifunenas, Subun Tualele and Subun Bestobe Village included in the high classification. Subun, Lapeom, Atmen and South Letneo villages are included in the Moderate classification and Oabikase Villages are included in the High classification. Oabikase village has high human capital due to the local wisdom of the community during a drought with the "toit ulan" event. South Letneo Village has high natural capital because the community can use productive land to plant various agricultural products and the village area is close to springs. All villages in Insana Sub-district have high

social capital because although they do not have a special organization to deal with disasters, each village holds a meeting once a month for mutual assistance in cleaning the village office and discussing problems related to village scope and having relatives who can be asked for help when a drought occurs. Oabikase village has a high physical capital because the distance traveled to get water is 0-100m and there is a water reservoir that serves the community. Subun Village, Lapeom, Atmen, Nifunenas, Subun Bestobe have high capital funds due to livestock ownership which can help the community's economy and are included in the category of receiving assistance and have easy access to loans to cooperatives and relatives..

**Table 12 Classification of community capacity in the villages of Insana Barat District**

Village	Human asset	Natural asset	physical asset	social asset	financial asset	Pentagon Area	Capacity Classification
Subun	1	1	2	3	3	9,035	Moderate
Lapeom	1	1	2	3	3	9,035	Moderate
Usapinot	1	1	2	3	1	6,182	Low

Village	Human asset	Natural asset	physical asset	social asset	financial asset	Pentagon Area	Capacity Classification
Unini	1	1	2	3	1	6,182	Low
Letneo	1	1	2	3	1	6,182	Low
Banae	1	2	1	3	1	5,231	Low
Atmen	1	2	1	3	3	8,084	Moderate
Letneo Selatan	1	3	2	3	1	8,084	Moderate
Nifunenas	1	2	1	3	3	8,084	Low
Subun Tualele	1	2	1	3	1	5,231	Low
Subun Bestobe	1	1	1	3	3	6,182	Low
Oabikase	3	1	3	3	1	11,888	High



**Figure 2 Pentagon Assets in Villages in Insana Barat District**

**4. CONCLUSION**

The ability of families to deal with drought can be seen from the assets they have. Asset capacity is determined by livelihood assets consisting of human capital, natural capital, social capital, natural capital and physical capital. From the results of the study, it is known that human capital in Insana Barat District is still low because the education of the majority of the community is low, natural capital is sufficient, financial capital is sufficient because people get assistance from the government, physical capital is low because access to clean water is far away, and paving roads and have good social capital due to high community kinship and members of community organizations. The overall capacity of the community in Insana Barat sub-district is divided into Usapinonot Village, Unini Village, Letneo Village, Banae Village, Nifunenas Village, Subun Tualele Village, Subun Bestobe Village belonging to low capacity, Subun

Village, Lapeom Village, Atmen Village and South Letneo Village were classified as medium capacity. and Oabikasi Village is included in the high classification.

**5. REFERENCE**

Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change*, 15(2), 77–86. <https://doi.org/10.1016/j.gloenvcha.2004.12.005>

Elkouk, A., Pokhrel, Y., Satoh, Y., & Bouchaou, L. (2022). Implications of changes in climate and human development on 21st-century global drought risk. *Journal of Environmental Management*, 317(May), 115378. <https://doi.org/10.1016/j.jenvman.2022.115378>

Kollmair, M., & Gamper, J. (2002). The Sustainable Livelihoods Approach: Input Paper for the Integrated Training Course of NCCR North-South. *Compiled by M. Kollmair and St. Gamper, Juli 2002 Development Study Group*, 9(September), 1–11. <https://www.alnap.org>

McClanahan, T. R., Donner, S. D., Maynard, J. A., MacNeil, M. A., Graham, N. A. J., Maina, J., Baker, A. C., Alemu I., J. B., Beger, M., Campbell, S. J., Darling, E. S., Eakin, C. M., Heron, S. F., Jupiter, S. D., Lundquist, C. J., McLeod, E., Mumby, P. J., Paddack, M. J., Selig, E. R., & van Woesik, R. (2012). Prioritizing Key Resilience Indicators to Support Coral Reef



- Management in a Changing Climate. *PLoS ONE*, 7(8).  
<https://doi.org/10.1371/journal.pone.0042884>
- Nasrnia, F., & Ashktorab, N. (2021). Sustainable livelihood framework-based assessment of drought resilience patterns of rural households of Bakhtegan basin, Iran. *Ecological Indicators*, 128, 107817.  
<https://doi.org/10.1016/j.ecolind.2021.107817>
- Quandt, A. (2018). Measuring livelihood resilience: The Household Livelihood Resilience Approach (HLRA). *World Development*, 107, 253–263.  
<https://doi.org/10.1016/j.worlddev.2018.02.024>
- Sharafi, L., Zarafshani, K., Keshavarz, M., Azadi, H., & Van Passel, S. (2020). Drought risk assessment: Towards drought early warning system and sustainable environment in western Iran. *Ecological Indicators*, 114(December 2018), 106276.  
<https://doi.org/10.1016/j.ecolind.2020.106276>
- Shen, J., Chanda, A., D'Netto, B., & Monga, M. (2009). Managing diversity through human resource management: An international perspective and conceptual framework. *International Journal of Human Resource Management*, 20(2), 235–251.  
<https://doi.org/10.1080/09585190802670516>
- Wang, P., Qiao, W., Wang, Y., Cao, S., & Zhang, Y. (2020). Urban drought vulnerability assessment – A framework to integrate socio-economic, physical, and policy index in a vulnerability contribution analysis. *Sustainable Cities and Society*, 54(December 2019), 102004.  
<https://doi.org/10.1016/j.scs.2019.102004>
- Water Resources Research - 2021 - Jenkins - An Integrated Framework for Risk-Based Analysis of Economic Impacts of Drought.pdf.* (n.d.).