UNTAR
FACULTY OF ENGINEERING

ICET 2017

3rd International Conference on Engineering of Tarumanagara
Jakarta, October 4th-5th, 2017

CONFERENCE PROGRAM & ABSTRACT BOOK

"SMART ENGINEERING FOR FUTURE CITIES"

FACULTY OF ENGINEERING
UNIVERSITAS TARUMANAGARA
Main Building, Campus I, Jl. Letjen S. Parman No.1, Jakarta Barat

UNTAR

ABSTRACTS

3rd International Conference on Engineering of Tarumanagara
(ICET)

"Smart Engineering for Future Cities"
Jakarta, 4-5 October 2017

UNTAR
Universitas Tarumanagara

FACULTY OF ENGINEERING
UNIVERSITAS TARUMANAGARA
JAKARTA-INDONESIA
2017

FOREWORDS
RECTOR OF UNIVERSITAS TARUMANAGARA

Keynote speakers, Honorable Delegates, Ladies and Gentlemen,

It is a great pleasure for me to open the ICET 2017 and to extend to you all a very warm welcome. We are grateful for having a number of participants who come here to share experience, and discuss problems of mutual interest with delegates from different cities and disciplines.

The topic of this conference, "Smart Engineering for Future Cities", could not be more important and relevant. If we explore the most populous cities in Asia, each city faces many complex problems that require different types of action. Einstein once said that "We can't solve problems by using the same kind of thinking we used when we created them." Engineers have a key role to play in creating and maintaining sustainable communities across the planet and we have to rise to the challenges we face very quickly. As engineers, we need to adapt our thinking, embrace advocacy and business planning, technology and computer sciences, work across wider domains and ensure that cities are truly able to meet the full needs of our future.

It is envisaged that the intellectual discourse in this event will result in future collaborations between universities, research institutions and industry both locally and internationally, particularly around issues of smart engineering and future cities.

I would like to congratulate the Organizing Committee of ICET 2017, for their utmost efforts and dedication. I would also like to express my gratitude to the sponsors for their contributions in making this conference a success.

I wish the International Conference on Engineering of Tarumanagara (ICET 2017) a very useful and fruitful event.

Thank you for your attention and contribution.

Rector

Prof. Dr. Agustinus Purna Irawan

FOREWORDS
CHAIRMAN OF THE ORGANIZING COMMITTEE

Welcome to the 2017 International Conference on Engineering of Tarumanagara.

This is the third event of the biannual international conference held by Faculty of Engineering of Universitas Tarumanagara since 2013. This time we choose the topic "Smart Engineering for Future Cities" in the hope that it will contribute to the dynamically changing world. Cities as human habitat should be ready and resilient to face those dynamic changes. Technology is one of strongest tools in our efforts of realizing the sustainability of our future cities. Innovative and smart engineering has an important key role to support those efforts.

I Hope this conference can give participants the opportunity to contribute valuable ideas as well as strengthen the networks among researchers, academics and professionals from different places, background and interests. Sharing ideas through research is the only way of achieving progress towards our objectives.

On behalf of the organizing committee, I would like to express our gratitude to the Foundation of Tarumanagara, Rector of Universitas Tarumanagara, Dean of Faculty of Engineering, partners and sponsors of ICET 2017, for their supports and helps. I also would like to thank the authors for their contributions. Without their contributions, this conference would never been realized. My sincere thanks go to my team who has worked really hard to prepare the event.

Finally, I wish you a nice day and enjoy the conference as well as the vibrant Jakarta.

Chairperson of 3rd ICET 2017

Dr.Eng., Titin Fatimah, S.T., M.Eng.

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		Euis Susanty, S.H.
		Muhammad Nur

ICET 2017
CONFERENCE PROGRAM

Day 1: Wednesday, October 4th, 2017

	Time	Activity
1	08.00-08.30	Registration + coffee break
2	08.30-9.30	Opening ceremony - Opening remarks from ICET 2017 chairperson - Opening remarks from the Dean of Engineering Faculty - Opening remarks from the Rector of Universitas Tarumanagara
3	9.30-12.00	Keynote Speaker I Prof. Dr. Stephen Cairns, Program Director od the Future Cities Laboratory, ETH Zurich *"Urban Transformations in Asia: Responsive Knowledge Strategies, Design Scenario, and Action Plans"*
		Keynote Speaker II Prof. Dr. Tech. Ir. Danang Parikesit, M.Sc. (Professor of Transportation Planning and Engineering UGM, Chair – Transportation Technical Committee, National Research Council) *"Updates on The Progress of Intelligent Transportation System for Indonesian Urban Areas"*
		Discussion (moderator: Dr. Danang Priatmodjo)
4	12.00-13.00	Lunch break
5	13.00-15.00	Parallel session I
6	15.00-15.15	Coffee break
7	15.15-17.00	Parallel session II

Day 2: Thursday, October5th, 2017

	Time	Activity
1	08.00-08.30	Registration + coffee break
2	08.30-10.30	Parallel session III
3	10.30-10.45	Coffee break
4	10.45-12.15	Parallel session IV
5	12.15-12.30	Closing
6	12.30- end	Lunch break

Note :
- Opening ceremony and plenary session: Main Building, Auditorium 3rd floor
- Parallel session: Main Building, 14th floor

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1	13.00 - 13.15	**5**	GREEN ARCHITECTURE STUDY ON CHANGES FOR SPACES IN GRIYA CINERE 1 HOUSING, DEPOK-WEST JAVA
2	13.15 - 13.30	**7**	REGIONAL AND CITY PLANNING: KAMPUNG PLANNING ARCHITECTURE STYLE OF DENAI ALAM AS SYMBIOTIC RELATIONSHIP BETWEEN HUMAN AND ENVIRONMENT
3	13.30 - 13.45	**10**	INTEGRATED SUSTAINABLE KAMPONG HYBRID IN CODE RIVERSIDE SETTLEMENT IN YOGYAKARTA, INDONESIA
4	13.45 - 14.00	**11**	PROSPECTS OF SUSTAINABLE WOOD BUILDING ARCHITECTURE
5	14.00 - 14.15	**17**	THE STRATEGIC PLANNING OF BORDER AREA IN WINI, REGENCY OF NORTH CENTRAL TIMOR OF EAST NUSA TENGGARA
6	14.15 - 14.30	**22**	COMPARISON OF BARRON AND HANSBO METHOD FOR DETERMINING VERTICAL DRAIN SPACING WITH TIME OF CONSOLIDATION AND RATIO OF COEFFICIENT OF CONSOLIDATION
7	14.30 - 14.45	**77**	HYDRAULIC HOUSE AS ALTERNATIVE HOUSE MODEL IN TIDAL AREA CASE STUDY OF KEMIJEN VILLAGE , SEMARANG
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No.	**Time**	**Paper ID**	**TITLE**
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2	11.00 - 11.15	**43**	IMPLEMENTATION OF PSYCHOLOGY EDUCATION WITH ADVANCED TECHNOLOGY IN ORDER TO DESIGN AN EDUCATION AND RESEARCH CENTER OF MANGROVE FOREST ECOSYSTEM AT PANTAI INDAH KAPUK
3	11.15 - 11.30	**50**	VERTICAL HYDROPONICS FARMING COMPLEX
4	11.30 - 11.45	**64**	NATURAL SCIENCE AND ENVIRONMENT EXPLORATORIUM
5	11.45 - 12.00	**21**	THE QUATTRO HELIX MODEL FOR COLLABORATION AND PARTICIPATION IN REVERSE LOGISTICS: INDONESIAN MOBILE PHONE INDUSTRY
6	12.15	**BACK to Auditorium for closing remark**	

ROOM 2

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SESSION 1	13.00 - 15.00		TECHNOLOGY
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2	13.15 - 13.30	**24**	DESIGNING INFORMATION SYSTEM AS BUSINESS PROCESS REENGINEERING WITH SDLC METHOD
3	13.30 - 13.45	**34**	DETERMINING EFFECTIVE FACE MILLING CUTTING PARAMETER FOR ALUMINUM ALLOY AA-6061 AND AA-7075 BASED ON SURFACE ROUGHNESS

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No.	**Time**	**Paper ID**	**TITLE**
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SESSION 2	15.15- 17.00		URBAN MANAGEMENT
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THURSDAY, OCTOBER 5th 2017

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SESSION 3	**08.30 - 10.30**		**SUSTAINABILITY**
5	09.30 - 09.45	**90**	STUDY OF PROCUREMENT, UTILIZATION, AND MANAGEMENT MOSQUE IN JEMBATAN BESI AREA
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THURSDAY, OCTOBER 5th 2017

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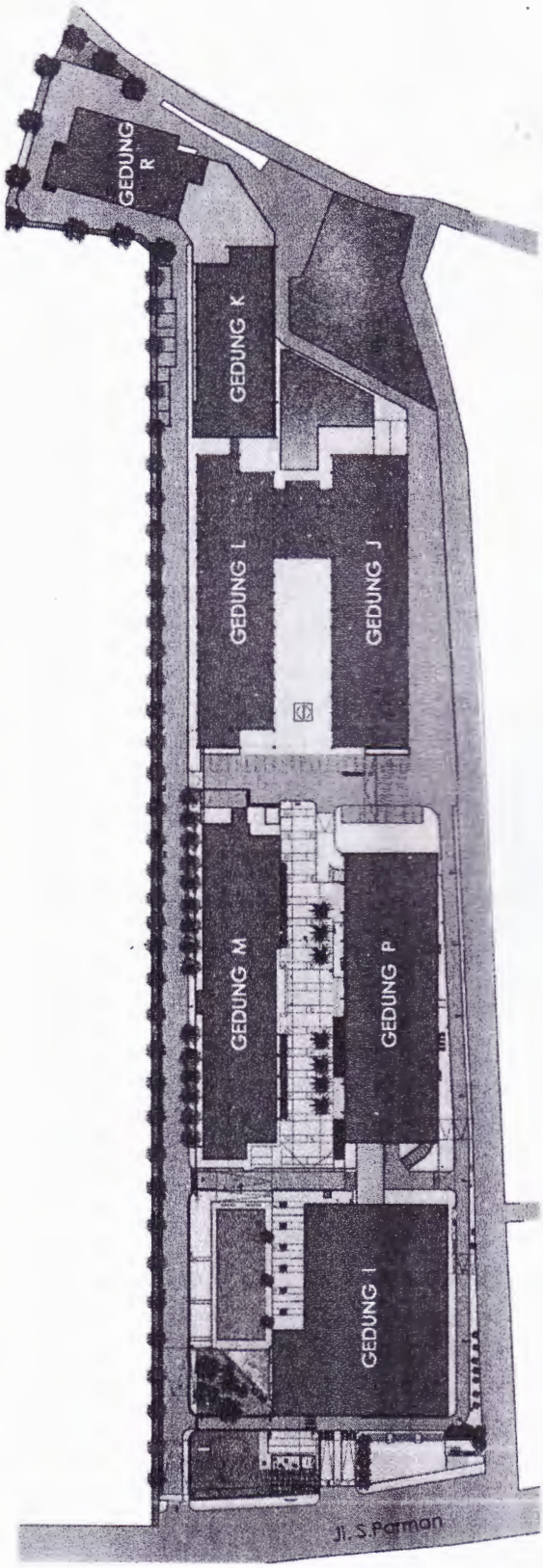
1	10.45 - 11.00	**63**	KALMAN FILTERING ON EARNED SCHEDULE METHOD
2	11.00 - 11.15	**8**	FACTORS AFFECTING CHOICE OF ROAD CROSSING METHOD
3	11.15 - 11.30	**57**	CHRONOGRAPHICAL SCHEDULING LOGIC METHOD FOR CONSTRUCTION SCHEDULING OF HIGH RISE BUILDING PROJECT IN JAKARTA
4	11.30 - 11.45	**47**	BUILDING CONSTRUCTION PROJECT DELAY ANALYSIS WITH ISOLATED COLLAPSED BUT-FOR (ICBF) METHOD
5	12.15	**BACK to Auditorium for closing remark**	

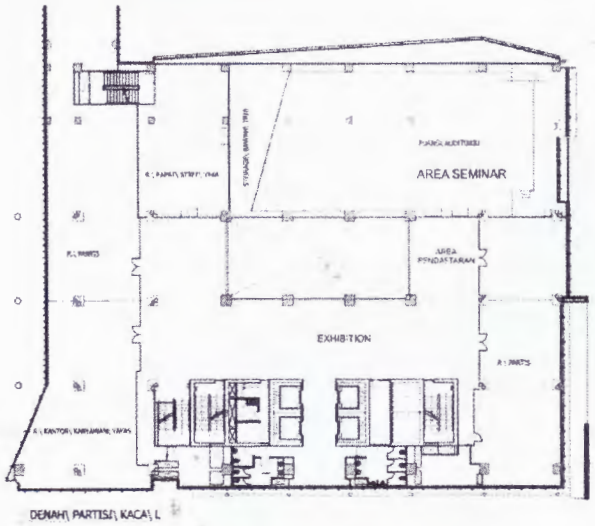
FLOOR PLAN

SITE PLAN

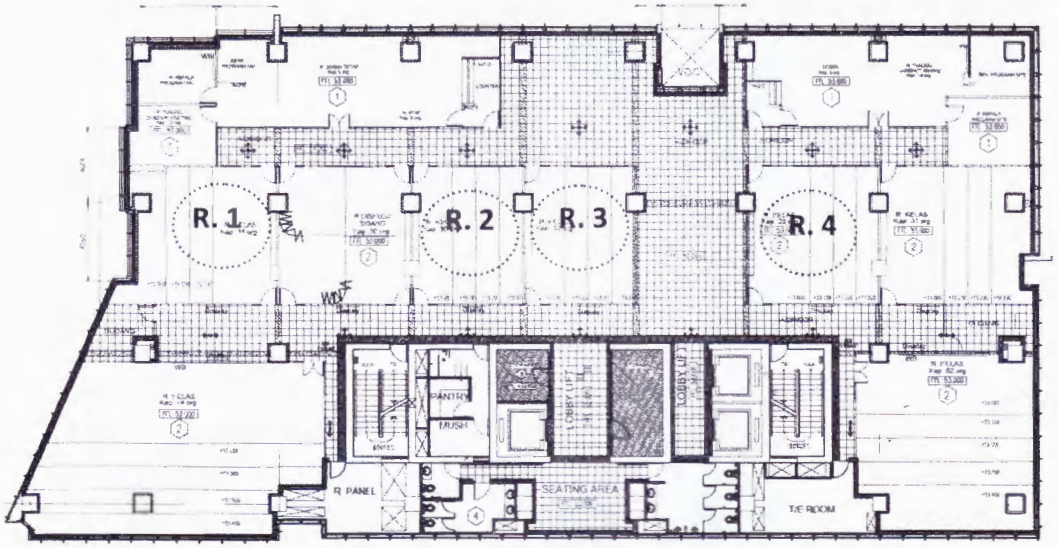


-Venue : 3rd Floor, Auditorium Building I (Gedung I)
-Parallel Session : 14th Floor, Building I (Gedung I)
-Praying Room (Musholla) : 3rd Floor , 5th Floor , 15rth Floor Building I (Gedung I) and 6th Floor, Building P (Gedung M)
-Praying Room (Friday) : 8th Floor, Building P (Gedung M)

3rd FLOOR



14th FLOOR



Note :

Paralel session : 14th Floor (Room 1, Room 2, Room3 and Room 4) Building I (Gedung I)

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SURAT TUGAS

No. : 0048/K.6/FAD/X/2017

Dekan Fakultas Arsitektur dan Desain Universitas Katolik Soegijapranata Semarang, memberikan tugas kepada :

Nama	:	Ir. IM. Tri Hesti Mulyani, MT. Ir. Etty E. Listiati, MT
Status	:	Dosen Fakultas Arsitektur dan Desain Unika Soegijapranata
Tugas	:	Pemakalah International Conference on Engineering of Tarumanegara : Hydraulic House As Alternative House Model In Tidal Area, Case Study Of Kemijen Village Semarang
Penyelenggara	:	Faculty of Engineering Universitas Tarumanegara Jakarta
Tempat	:	Universitas Tarumanegara Jakarta
Waktu	:	Rabu & Kamis, 04 s/d 05 Oktober 2017
Lain-lain	:	Harap melaksanakan tugas dengan penuh rasa tanggung jawab dan memberikan laporan setelah tugas selesai

Demikian Surat Tugas ini untuk dapat dipergunakan sebagaimana mestinya, dan setelah selesai melaksanakan tugas tersebut, mohon memberikan laporan.

Semarang, 02 Oktober 2017
Dekan

Dra. B. Tyas Susanti, MA, Ph.D
NIDN 0626076501

Telah melaksanakan tugas,

(TITIN FATIMAH)

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Status	:	Dosen Fakultas Arsitektur dan Desain Unika Soegijapranata
Tugas	:	Pemakalah International Conference on Engineering of Tarumanegara : Hydraulic House As Alternative House Model In Tidal Area, Case Study Of Kemijen Village Semarang
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Wakil Dekan I,

Ir. IVI. Tri Hesti Mulyani, MT
NIDN 0611086201

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"Smart Engineering for Future Cities"

October 4th-5th, 2017
Faculty of Engineering, Universitas Tarumanagara, Jakarta, Indonesia

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HYDRAULIC HOUSE AS ALTERNATIVE HOUSE MODEL IN TIDAL AREA CASE STUDY OF KEMIJEN VILLAGE , SEMARANG

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Abstract

Tidal floods occur because of climate change that results in rising sea levels. Tidal floods hit coastal areas in Indonesia, one of which is Semarang city in the coastal region of North Java Island. Kemijen Village is a village of the sub-district of East Semarang located in the north and near the beach. The urban village has been affected by the flood started around 1980's. It consists of 11 RWs (Rukun Warga), and RW IV still experiences flood or tidal flood. Tidal floods make the residents have to raise their house (for the rich). For those who can not afford it, they are forced to live in a house that will always be exposed to tidal flood. Their houses gradually lie beneath the surface of the road because the neighborhood road in front of the houses is always raised by the city government. Therefore, the steps taken by the residents to overcome the tidal flood to get into the house is by pumping/removing water from the houses.

The research tried to find alternative house model that can adapt to tidal flood in Kemijen Village, especially in RW IV. In the research, it took six houses as the sample (10% of the population), which were the houses which were their floors were still lower than the road and still flooded.
The research used qualitative description analysis method. The research result is in the form of the proposal of a house model adaptive to tidal flood in the form of hydraulic house.

Keywords: house, adaptation, tidal flood, hydraulics, Kemijen

1. INTRODUCTION

Climate change leads to extreme changes in nature. One of the impacts is the rising of sea level. Sea level rise is caused by:

- Melting of ice at the poles due to global warming
- The increasing amount of surface water entering the sea since absorption of water into the soil is reduced due to the construction of pavement on the surface.
- Land subsidence.

It is estimated that from 1999 to 2100, the sea level rise is about 1.4-5.8 m (Dahuri, 2002 in Priyambodo D.G.).
Tidal flood has hit several coastal areas in Indonesia such as Sumatra, Kalimantan, Sulawesi, Bali, Papua, and Java. The cities in the coastal areas of Java are experiencing tidal flood, such as: Jakarta, Subang, Tasikmalaya, Pengandaran, Probolinggo, Pacitan, Banyuwangi, Jember, Trenggalek, Malang, Tulungagung, Lumajang, Gresik, Tuban, Pemekasan, Surabaya, Kulon Progo, Bantul, Pekalongan, Cilacap, and Semarang (Republika.co.id, June 7, 2016). The sub-districts of North and East Semarang are vulnerable to tidal floods. Kemijen Village located in the Northern area of the sub-district of East Semarang is one of the residential areas which is routinely affected by tidal flood. Kemijen Village, which is the research location, consists of 11 (eleven) RWs (Rukun Warga) since 1980's has experienced tidal flood. The sea level rise is then

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exacerbated by land subsidence of > 8 cm/ year in Kemijen Village. Hence, the impact of tide increases every year. In addition to tide, the region is also prone to flood disaster because Kemijen Village is passed by Banger River as one of the main rivers with a very high sediment level (Kencana A.D., Yuliastuti N, 2016)

In September 2016, the problems in Kemijen Village have been resolved by the dredging of Banger River, the construction of Banger polder, and temporary dam. However, some places are still inundated when it rains, especially in RW IV.

The effort made by the residents to overcome the tidal flood was to elevate the neighborhood road. The road elevation is useful for people's access to do daily activities. However, it poses a new problem for the poor because they cannot raise the floor of their houses so that the floor surface is below the road surface. The condition highly disturbs the activities of the residents because the land is always inundated. Therefore, in the research, it is proposed that there is an adaptive house model for tidal flood.

2. RESEARCH METHOD

The methods used in this research were:

- Questionnaires and interviews to the residents. The questionnaires consist of several questions related the physical conditions of houses, and the questionnaires were distributed to 21 respondents. Furthermore, the study then focused on 6 houses in RW IV which experienced the worse condition because of the tidal. Indepth interview was done toward some of key persons in the area of Kemijen to dig more information about the strategy done by the community to face the tidal.The survey questioner was conducted with face to face interview. Doing face to face interview was the best way to collect such data and the interviewee can collect more data as the respondent can provide additional information when it needed (Robson 2002, 271)
- Visual recording of field conditions (photos)
- Dimensional measurements and recording of home specifications as the study case

The sample of the study was determined by 10% of the houses of tidal inundated with severe conditions. In this case, people with severe conditions were the residents in RW IV, 55 houses with 72 families.

The data collection was conducte by recording the physical problem of the resident's houses which were related to tide.

The analysis was conducted using qualitative description with reference to the standard of simple habitable home. The expected output was the draft model of house design adaptive to tide.

Focus Group Discussion was done after the draft design was set up. Focus Group Discussion is one of the important method for gathering ideas, opinions, beliefs and other cognitive expression from the community when the design was shared to them (Kitzinger, 1995, 299).

3. RESULTS AND DISCUSSION

3.1. Location and Sample of Residential Homes

Kemijen Village is located in the northern area of the sub-district of East Semarang and consists of 11 (eleven) RWs. Some residents in the Village had managed to overcome the problem of tide by means of:

- Neighborhood road elevation

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- House floor elevation made by most homes; every five years, in average
- Suctioning water using pump and discharged to Banger River.

The map of Kemijen Village can be seen in the figure below:

Figure 1: Mapping of the RW in Kemijen Village, the Sub-District of East Semarang
Source: Kemijen Village Office, 2017

Of 11 (eleven) RWs in Kemijen Village, RW IV is the most severe areas that have not been able to overcome the problem of tidal flood and flooding because the drainage in this region is not functioning. The existing drainage is buried in soil sediments so that water cannot flow on the duct, and it actually overflows to the street and to the houses. RW IV, which was the research location, consists of 2 RTs (Rukun Tetangga) inhabited by 72 families in 55 houses. In this study, 6 (six) samples were taken (about 10%) that have not been able to overcome the problem of tidal flooding because the floor surface of the houses is still lower than the road surface. The details of the 6 houses that were sampled are as follows:

1. Mr. Timbul's house (RT 1)
   The floor of the house is 60 cm lower than the street although the floor of the house has been raised 6 (six) times since 1997. Each time it was raised to 50 cm, and it was last raised in 2000.

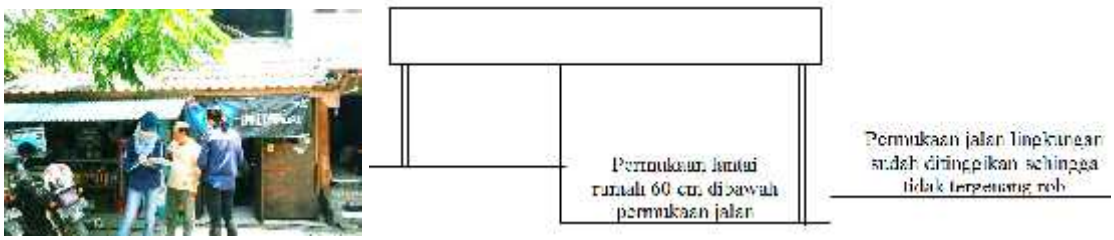

Figure 2: Front View and Piece of Mr. Timbul's house (sample 1)

2. Mr. Bambang Susilo's house (RT 1)
   The floor of the house is 60 cm lower than the street although the floor of the house has been raised 3 (three) times since 1997. Each time it was raised to 50 cm, and it was last raised in 2001.

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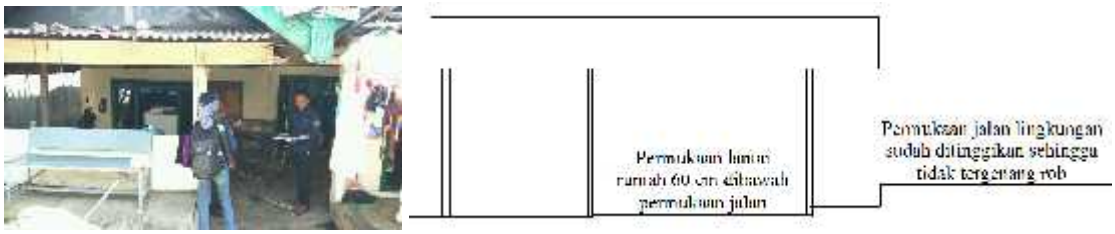

Figure 3: Front View and Piece of Mr. Susilo's house (sample 2)

3. The house of Mr. Mahdi (RT 1) consists of 2 units. The floor surface on one unit of the house has already been 1.5 m higher than the street surface and the other unit is still 30 cm lower than the road surface.

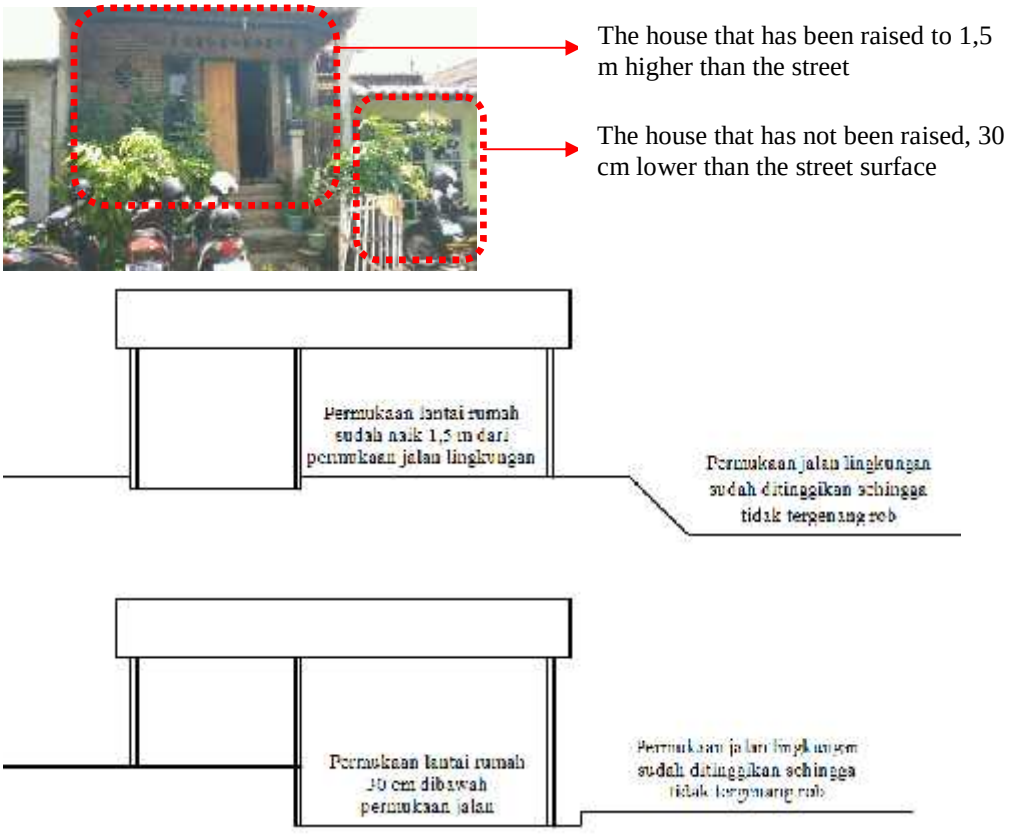

Figure 4: Front View and Piece of Mr. Mahdi's house (sample 3)

4. Mrs. Hanifah's house (RT 2).
   The floor of the house is still lower than the street although the floor of the house has been raised 3 (three) times since 2002. Each time it was raised to 50 cm, and it was last raised in 2009.

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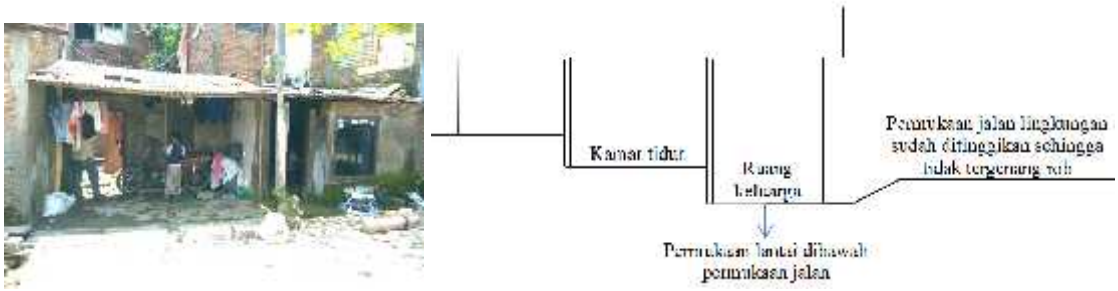

Figure 5: (a) Front View and(b) Piece of Mrs. Hanifah's house (sample 4)

5. Mrs. Kartupi's house (RT 2)

   The floor of the house is still 80 cm lower than the street although the floor of the house has been raised 3 (three) times since 2000. Each time it was raised to 50 cm, and it was last raised in 2004. The elevated one was only the floor of the house bi backfilling. The walls and roofs were not elevated so that the doors, windows, and roofs are very low. The threshold height of the door is only about 160 cm.

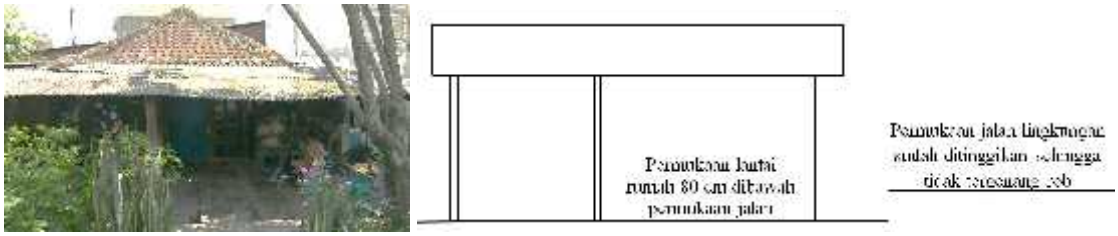

Figure 6: (a)Front View and (b) Piece of Mrs. Kartupi's house (sample 5)

6. Mr. Suyanto's house (RT 2)

   The floor of the house is still lower than the street although the floor of the house has been raised 5 (five) times since 1992. Each time it was raised to 30 cm, and it was last raised in 2014.

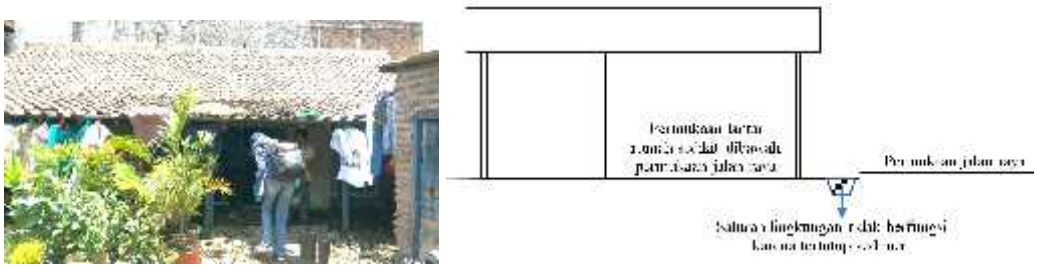

Figure 7: Front View and Piece of Mr. Suyanto's house (sample 6)

Based on the research results to 6 samples of the houses in RW IV, the people have been trying to overcome the tidal flood by raising the floors. However, because the neighborhood street was also always raised by the city government, it seemed that the floors of the houses remained lower than the street (about 30-80 cm). Since the floors of the houses were lower than the street, water flew into the houses. The condition was very uncomfortable when it rained. Water inundates the houses, so the activities were disrupted. The way that had been done was to pump the water out of the houses. The

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way was very disturbing to the activities of the residents. The study proposed a house that can be free from flooding. Based on the interview, the height of the tide that ever occurred in Semarang was about 1 meter. Therefore, the proposed house model is a house with the platform of 1.5 meter high from the ground/ street. The height was taken based on existing data and the field data from the residents' houses in RW IV which had been elevated to 1.5 meters and have never been flooded (sample 3, Mr. Mahdi's house). The stage house can be raised hydraulically as high as 1 meter. Floor elevation to the house can be applied when tidal water starts to rise near the height of the stage house floor (1.5 meters).

Based on the data on 6 home samples, the size of their house plots ranged between 7- 9 m wide and 13 to 17 m long. For the people who have money, they could raise their houses from the floor to the roof, such as in sample 3 (Mr. Mahdi's house). He raised his house as high as 1.5 meters from the street. However, for those who do not have the funds/ money to raise their houses, they let their houses flooded, such as in the samples 1, 2, 4, 5 and 6. Most of RW IV residents of Kemijen Village were workers and earned less, so they did not have enough funds to build/ elevate or to renovate their houses.

3.2. Hydraulic House

Based on the above data, the proposed house model is a stage house of 1.5 m high, which can be raised hydraulically when tidal flood rises near the floor of the house. In addition, the house can be built gradually (growing house). The size of the hydraulic house is made with the module of 3 x 3 m (size for a space). The module was taken based on the analysis that the width of the existing room in the sample is in the average of multiplication of 3 m. The size can physically fill up the space for one person to do joint activities (more than one person). The stage house with the size of 3x 3 m can be used when it has tidal flood. People in the house can move because there are parts of the house which are not inundated by water/ flood (the floor of the house is not wet).

The following is the analysis of hydraulic house built gradually

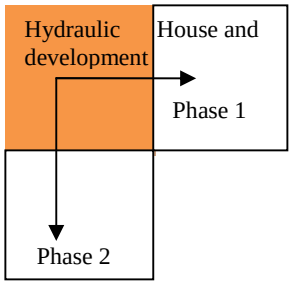

Figure 8: The scheme of hydraulic house plan and the development

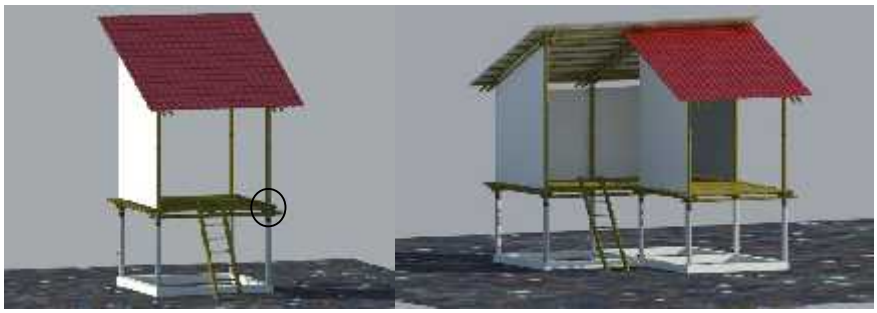

Figure 9: The shape of hydraulic house and the development

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The house can be developed in accordance with the capability of citizens and considering the size of existing plot. The house development is proposed to be able to do in 2 phases, 1 phase to the side (left or right), 1 phase to the front/ back. The location of the house/ space model, and it does not have to be started from the front. It can be started from behind so that the old house form can still be kept. Hydraulic house (model house), initially with the size of 3 x 3 m, can be an evacuation room when flood occurs. However, when it has been developed, it can be a model house used for activities during tidal floods or floods.

3.3. Mechanism of Hydraulic House.

The proposed mechanism of hydraulic house is as follows:

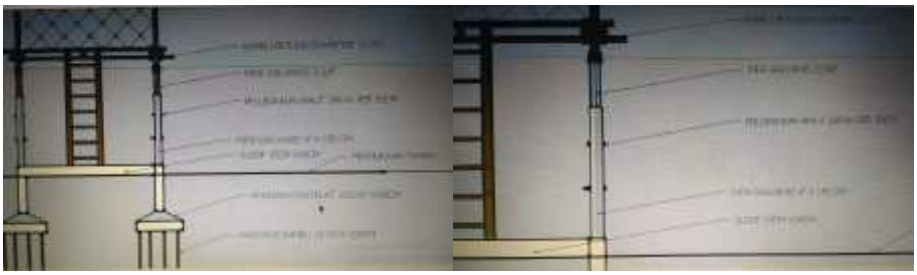

Figure 10: (a) Columns of galvanized hydraulic system pipes mounted on sloof. (b) the rise of 50 cm of inner galvanic pipe when water level approaches the floor of the house.

From 6 samples of the houses, one of the houses will be taken to be made into hydraulic house. The selection was based on the data in the field which was still possible for the application of hydraulic house. Therefore, Mrs. Hanifah's house (sample 4), which was very severe, was selected. In the house yard, there were still puddles. (See the photos of Mrs. Hanifah's house)

Figure 11: Mrs. Hanifah's house: (a) front view (b) inside the house

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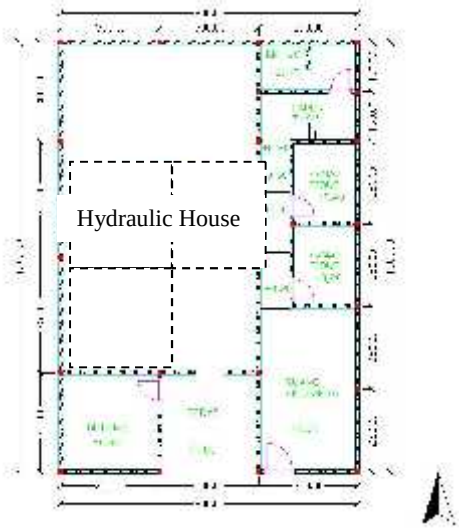

Figure 12: The Plan of Mrs. Hanifah's house with the additional scheme of hydraulic house

With the presence of hydraulic house, the residents did not have to perform filling for floor elevation, but using the stage house system so as not to damage the existing soil conditions. As a consideration for the floor elevation in order not to be too heavy, the building materials for walls and roofs were attempted using light and relatively inexpensive materials. Local climate conditions were also the factors in consideration, namely the presence of sea water/ salt water that will accelerate the corrosion of the materials made of metal/ iron. Therefore, when using iron, it must be painted. In addition, the building materials were selected which are not easy to corrosion when exposed to tidal flooding/ sea water. The hydraulic house used a construction system of bamboo stage house. According to Frick, Heinz (2004, p. 37), stage house is the most suitable construction for bamboo framed houses since all parts of the building are detached from the ground and open to the wind. However, it was not completely bamboo because the bottom of the floor and foundation did not use bamboo.The bottom column of the floor (stage) used a hydraulic system. The materials used were galvanized iron with a diameter of 4" (for outer galvanic columns) and a diameter of 3¾" (for inner galvanized columns). The foundation used was the foundation of local concrete plate with bamboo shoot under it (if the soil was still in the form of swamp/ puddle). When there was no puddle, it could directly apply the foundation of local concrete plate with sloof bond. Over the galvanized columns, it used bamboo columns, so the bamboo column was not exposed to water. The bamboo used was *petung* bamboo with the diameter of 12 cm. Meanwhile, the construction of bamboo used string construction with a rope. Overall, the hydraulic house used bamboo construction, so it could be done by the residents themselves, both individually and mutually cooperative.

4. CONCLUSIONS

With hydraulic house, it is expected to help solve the problem of tidal flooding or flood in RW IV, Kemijen Village. The residents of RW IV have a dry place (free from flood water) when it rains. A hydraulic house was built 1.5 meters above the street (stage house), so it is expected to be able to overcome the problem of flooding or tidal flood for 5-10 years. When water is near the surface of the house floor, the floor of the house can be raised. Once raised, it can be as high as 50 cm, and it is enough within 3-5 years.

The hydraulic house can be developed according to the capabilities and needs of the

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residents of Kemijen village with the width of the house development adapting the module of 3x3 m.

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