Development of Resident Participation-Type Slope Measurement/Monitoring System in Mountain Region

Tomofumi Koyama, Seiji Kondo, Taizo Kobayashi, Shinichi Akutagawa, Takeshi Sato, Katsuyuki Nakata, and Kazuyuki Shimojima

Abstract

In this paper, the authors proposed the "resident participation-type slope measurement and monitoring system" to detect the premonitory symptoms of sediment disasters in the mountainous area (Takasu Town, Fukui City, Japan). The key concepts of resident participation-type slope measurement/monitoring are (1) visualization, (2) daily routine, and (3) voluntary/proactive involvement. The residents will not only monitor the danger slopes and notice unusual events, but also try to establish a system to grasp the slope deformation/displacement quantitatively. For this purpose, some different types of sensors based on the on-site visualization (OSV) concept were introduced to the dangerous slopes and retaining walls selected by the residents and geotechnical experts. The OSV sensors are low cost and visually excellent measuring device with simple measurement principle. Further improvements of measurement and recording methodology are required to increase the participation of residents to the slope measurement and monitoring.

Keywords

Slope measurement/monitoring • Resident participation • Disaster prevention/mitigation activities • Marginal settlement • Mountainous area

Introduction

Many villages in mountainous areas in Japan are designated as sediment-related disaster warning areas, and there is a high risk of sediment-related disasters such as debris flows and slope failures. In addition, many villages are becoming vulnerable due to the aging of the population, so-called marginal village.

In order to improve the local disaster prevention ability in mountainous areas, it is necessary to become regional disaster prevention activities as everyday affairs mainly considering "mutual assistance" and "self-help" of each individual (Yamori 2017). For this purpose, experts will discuss with the local residents how to recognize the risks of sediment-related disasters around them correctly and not to rely too much on "public assistance" such as information given from the government. It is necessary for the residents to consider their own safety by themselves.

In this study, in Takasu Town, Fukui City, Japan in order to promote local disaster prevention activities, observations were conducted on slopes that are considered to have a high risk of collapse based on the results of interviews with residents and on-site surveys by geotechnical experts. By installing the measurement/monitoring equipment, the residents will not only monitor the danger points and notice unusual events, but also try to establish a system to grasp the slope deformation/displacement quantitatively called the

T. Koyama (✉) · S. Kondo
Faculty of Societal Safety Sciences, Kansai University, 7-1 Hakubai-cho, Takatsuki, 569109, Osaka, Japan
e-mail: t-koyama@kansai-u.ac.jp

S. Kondo
e-mail: kondo.s@kansai-u.ac.jp

T. Kobayashi
College of Science and Engineering, Ritsumeikan University, Kusatsu, 525-8577, Shiga, Japan

S. Akutagawa
Graduate School of Engineering, Kobe University, Kobe, 657-8501, Japan
e-mail: cadax@kobe-u.ac.jp

T. Sato
Asano Taiseikiso Engineering, Tokyo, 110-0014, Japan
e-mail: satoh-tks@atk-eng.jp

K. Nakata
Office Himorogi, Kyoto, 603-8347, Japan
e-mail: himorogi@s3.dion.ne.jp

K. Shimojima
Technical Think, Amagasaki, 661-0953, Hyogo, Japan
e-mail: simojima@technicalthink.jp

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"resident participation-type slope measurement/monitoring system".

Outline of Takasu Town, Fukui City, Japan

Takasu Town in Fukui City, Fukui Prefecture was selected as research area. Takasu Town is a rural village located on the hillside of Mt. Takasu (elevation of 438 m), about 20 km northwest of the center of Fukui City, with 38 households and 45 (out of 68) people over 65 years old (the percentage of population over 65 years is 66%) according to the demographics of Fukui City (as of March 2020) (Fukui City 2020). Generally, villages over 65 years old with more than 50% of the population are called "marginal villages", and those where the age of 65 and over account for more than 70% of the population are called "critical communities".

There are only two main roads leading to Takasu Town from center of Fukui City, narrow city roads with a width of about 4 m. The road in Takasu Town, which is located at a relatively high altitude of about 200 m above sea level, is a forest road surrounded by slopes. In addition, as shown in Fig. 1, the entire town is in a large landslide terrain, and sediment-related disaster special warning/warning area for steep slopes exist around the village, and some are designated as debris flow alert areas. In fact, collapse of living roads leading to villages, forest roads in the districts, and fields have frequently occurred, and the frequency of torrential rain has increased in recent years, and therefore, residents' awareness toward the risk of landslides is increasing.

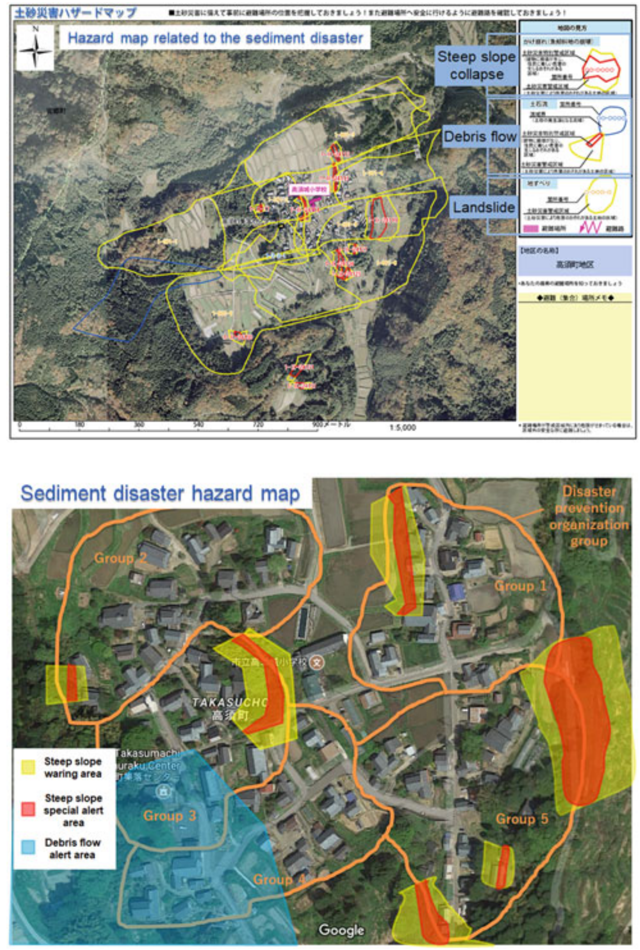

Fig. 1 Hazard map related to the sediment-related disaster of Takasu Town, **a** officially announced by Fukui City and **b** enlarged picture of sediment-related disaster special warning/warning area

Concept of Slope Measurement/Monitoring with Residents' Participation

The following three points should be considered when developing a slope measurement/monitoring system with the participation of residents. In other words, (1) visualization, (2) daily routine, and (3) voluntary/proactive involvement. Firstly, "visualization" refers to visualization of the danger level, and it is easy for residents without specialized knowledge to understand the danger of slopes using simple observation equipment with simple principles of measurement and monitoring. Secondly, "daily routine" means that the residents themselves measure and monitor slopes on a daily basis, rather than conducting them regularly as in disaster prevention drills. To this end, it is necessary to propose simple measurement and monitoring methods so that the residents themselves can easily measure and monitor the slope from their daily lives, and to devise ways to incorporate the act of slope measurement and monitoring as part of their daily lives. Lastly, "voluntary/proactive involvement" means that more and more residents are involved in slope measurement and monitoring daily, raising awareness of "self-help" and disaster prevention. If you notice "unusual events" on a slope different from your daily life, you need to be aware that residents who received unilateral information on disaster prevention may also be able to send information on the contrary.

Monitoring of Dangerous Slopes Using OSV Sensors

Types of Measuring Equipment and its Principle

Since the main purpose was to make the residents themselves involved in measurement and monitoring on a daily basis, and to be aware of "unusual events" that are different from the everyday, the measurement and monitoring system should not be expensive, elaborate, and did not require specialized knowledge. Adopted OSV (On-Site Visualization) sensors (Akutagawa 2017; OSV conthosium 2020) in this study, which is a low cost, simple and visually excellent measuring device.

POCKET (A Pocket-Size Light-Emitting Inclination Sensor)

The "POCKET" is a device that combines a fixed inclinometer and an optical device, and the color of the head changes according to the set criteria (green, yellow and red). In this measurement, the sensor was placed at the position where the inclination of the retaining wall and/or slope was measured, and the slope stability was confirmed by observing the color emitted from the head of the device.

Normally, dry batteries are used as the power supply. However, in this measurement, in order to eliminate the trouble of replacing the power supply and enable long-term measurement, the system was changed to a self-power generation type using a solar battery. POCKET has a built-in data recording mechanism inside the main unit (1 hour pitch, data capacity about 1.5 months). If measurement results are collected, inclination data is stored as digital data in addition to monitoring by light emission.

SOP

"SOP (Single Observation Point)" is a method of visually grasping the movement of the measurement target using a mirror. In the measurement method, a light source is installed in a stable place where no deformation occurs, and the light is visually checked by the observer from the same stable place. The mirror at the measurement point adjusts the direction so that the observer can see the light reflected on the mirror at the initial stage. When the measurement target is deformed/displaced and the mirror rotates or moves, the image of the light source in the mirror moves from the initial state. Therefore, the observer can visually grasp the deformation of the measurement target. Furthermore, when the deformation is large, the reflected light may protrude from the mirror surface and the image may not be visible.

Theoretically, the rotation angle of the mirror can be measured from the distance between the observer and the mirror, the distance between the mirror and the light source. Therefore, in this measurement, since the observers are residents who do not have specialized knowledge, we decided to monitor from the viewpoint of whether the light moved or not.

A See-Through Pole

"A see-through pole" is a method in which a reference pole with a viewing window and several observation poles for measuring displacement are arranged in a straight line, and the movement (gap) of the observation pole is checked from the reference pole. In other words, the displacement of the slope and/or shoulder of roads causes the observation pole to fall and/or shift, so that the line of sight from the reference pole is not straight, and the residents visually notice the deformation of the slope or shoulder of roads easily. If the grasp of quantitative behavior of the observation pole is required, the displacement can be quantitatively confirmed by measuring the mounting position at the beginning of the installation and performing the survey again when the deformation occurs.

Installation Location of OSV Measurement Equipment in Takasu Town

Based on the results of interviews with residents and reconnaissance by geotechnical experts, totally six dangerous slopes and/or retaining walls were selected (two slopes along the access road (city road) to Takasu Town, one retaining wall along the agricultural road, one steep slope/retaining wall behind the elementary school and on three steep slopes behind the houses) and different types of OSV sensors were introduced (see Fig. 2). The positions of the six measurement points selected in this study are shown from ① to ⑥ in Fig. 2.

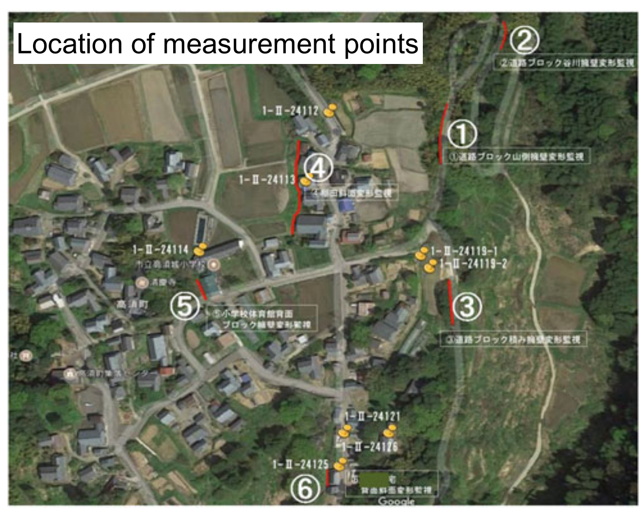

Fig. 2 The location of the six measurement points selected in this study

Fig. 3 “See-through poles” using observation poles and reference pole with a viewing window

Deformation Monitoring of Valley Side Slope Along City Road (①)

This measurement point is along the city road used as community road. On paved roads with a width of 4 m or less, there are concerns about deformation of retaining walls on the mountain side and slope failures on the valley side. Therefore, a measuring device using poles was installed at the shoulder of the city road (see Fig. 3). The shoulder of the road is located near the top of the valley side slope, and this part may collapse due to deformation of the slope and cut off the road.

Since the road alignment at the measurement position was close to a straight line and the street of the pole could be seen, “a see-through pole” was adopted. The observation pole was attached to a guardrail column installed on the shoulder of the road. However, the reference pole, which should not be affected by the slope displacement, was installed off the slope and away from the guardrail support. Slope deformation measurement is performed through a viewing window installed on the reference pole to measure whether the street on the observation poles hold a straight line.

Deformation Monitoring of Valley Side Retaining Wall Along City Road (②)

At the curved part of the city road (extension of the city road in ①), the top of the retaining wall on the valley side has already been deformed so as to fall down to the valley side, and the paved road is partially cracked. (See Fig. 4a–e).

Since the installation location is a curved section, it is impossible to see through the street like an observation pole, so here SOP was adoped to perform deformation measurement. The location of observation point was set on the shoulder of a relatively wide curve so that the reflecting mirror could be viewed from there.

A peephole with a diameter of about 5 mm is installed at the center of the measurement board, and the ovservers check the red and yellow indications of the measuring plate reflected on the mirror through the peephole. At the time of installation, it is adjusted so that the display of the measurement board is reflected on the mirror when looking through the peephole. A displacement confirmation line is also drawn radially around the peephole on the back of the measurement board, and when the retaining wall is displaced, the displacment can be calculated the distance the peephole and eye position to see the display plate reflected on the mirror. The displacement confirmation line drawn on the back of the measurement plate to measure the direction and the amount of the displacement at that time.

Slope Deformation Measurement Near Rice Terraces (④)

The rice terraces are on a hill with a height of 4 to 5 m, and a steep slope continues from the hill. The neighboring houses are built along the steep slope, and the residents living there are concerned about the collapse of slope along the rice terrace. According to the interview surveys, the slope along the rice terraces is recognized as the one of the most dangerous places in the town (see Fig. 1).

Therefore, the SOP was used to measure the deformation of the terrace slope. A ridgeway close to the house under the rice terraces was selected, and three SOP mirrors (reflecting mirrors) were installed. The light source (small LED light) and observation points used for the SOP are set next to the pool at the elementary school and beside the houses under the terraced terraces. From the installed measurement points, the angle of the reflector was adjusted so that the remaining one could be checked from the side of the house under the terraced rice field. Figures 5a-d show the initial setting state of SOP and the loaction of reflecting mirrors and observation points. For the measurement, an LED light is installed at the light source position to check whether the light from the reflector is visible. The measurement accuracy is such that the distance from the observation point to the reflector is about 70 m, so that the angle change of the reflector is about 0.05° and the light source is not reflected on the mirror. The measurements by reseidnets were carried out by recording whether the light reflected by the reflector was visible or not.

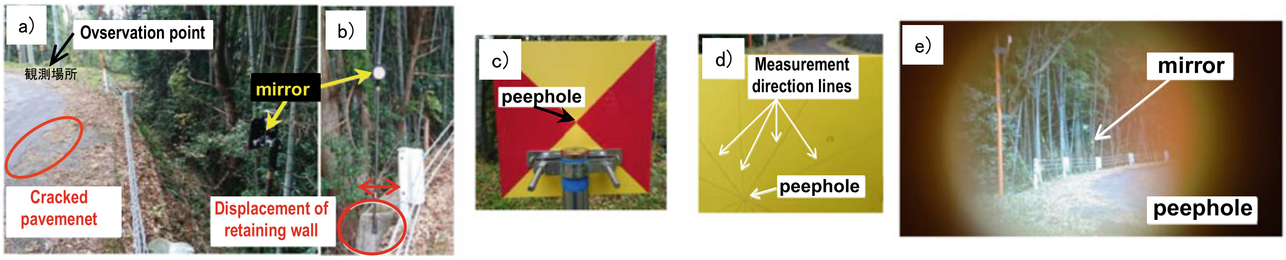

Fig. 4 Slope measuement/monitoring using SOP, **a** retaing wall, **b** mirror, **c** measurement board (front face), **d** measurement board (back face), **e** view from peephole installed at the center of the measurement board

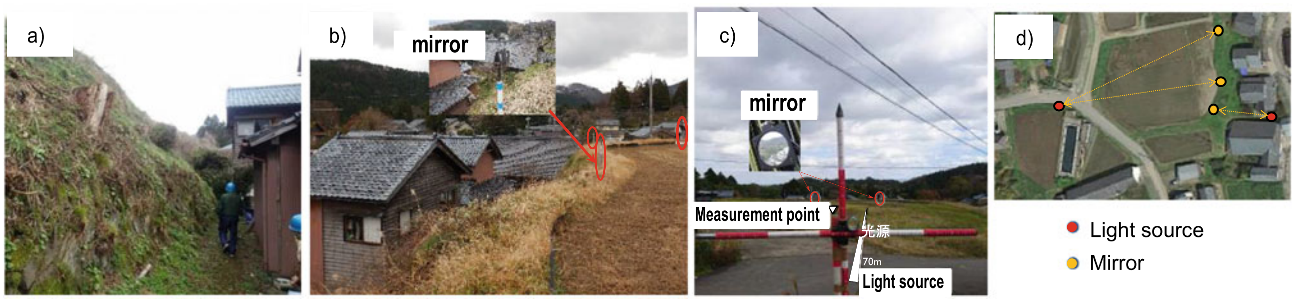

Fig. 5 Slope measuement/monitoring using SOP, **a** rice terraces behind the houses, **b** reflecting mirrors installed at rice terrace, **c** light source and observation points, **d** location of light source and mirrors

Deformation Monitoring of Block Retaining Walls Along Farm Roads, Block Retaining Walls Behind Elementary School Gymnasiums, and Slopes Behind Houses (③, ⑤, ⑥)

The block-retaining wall along the farm road was collapsed once in the past. After the collapse, the slope above the top of the retaining wall has been reenforced by ground improvement. However, it is necessary to monitor the sts-blility of the slope and check the soundness of the retaining wall, and therefore selected as a measurement point (see Fig. 6a).

The only elementary school in the town is currently closed, but its gymnasium is used as a meeting place for residents. In addition, it may be used as a temporary evacuation place at the time of disaster. At present, there is a block retaining wall behind the gymnasium, and a natural slope is approaching above the retaining wall. Groundwater is constantly leaking from the retaining wall. Since the distance between the gymnasium and the retaining wall is about 1.5 m, the gymnasium may be damaged by flooding during torrential rainfall and the collapse of the retaining wall. Therefore, we decided to measure the deformation of the block-retaining wall behind the gymnasium (see Fig. 6b).

In the town, there is a slope on the back of the house that exceeds the two-story roof, and there was a place where the slope collapsed due to past torrential rainfall and sediment flowed into the house. Residents living there were concerned about the slope failure, so this slope was selected as a measurement point, and the deformation of the slope could

Fig. 6 Slope measurement/monitoring using POCKET, **a** block retaining walls along farm roads, **b** block retaining walls behind elementary school gymnasiums, and **c** slopes behind houses

be measured mainly for the residents living there (see Fig. 6c).

For these measurement points, slope inclination measurement using POCKET was performed to measure the deformation of the retaining wall and slope, and the. power supply of the measuring instruments was secured using solar panels at all three measurement points. In POCKET, the color of the light at the head of the measuring instrument changes depending on the inclination, so when displacement occurs on each retaining wall and/or slope, the color can be used to visually judge the situation. In this study, the lighting color of POCKET is set to be green when the tilt angle does not change, and to be yellow and red when the inclination angle changes by 0.2° and 0.4°, respectively. The thresholds for the set color and angle were set with reference to past slope failure experiment results (Toyosawa et al. 2007). When the residents confirmed the change in emission color, the slope was measured and surveyed separately by geotechnical experts to check the stability of the slope. The block retaining wall on the back of the gymnasium has a long depth, so three POCKETs were installed.

Development of Observation System and Establishment of Recording Method of Observation Results

Observation System at the Beginning of Installation of Measurement Equipment

The installation of all OSV measurement equipment was completed in mid-November 2017, and on November 26, a briefing and tour of the use of measurement equipment for members of the town's voluntary disaster prevention organization (the chairman of neighborhood association, vigilante, and group leader). Regarding the measurement/monitoring system (observation members and measurement frequency, etc.), the members of the voluntary disaster prevention organization decided without any instructions or requests from experts. At the beginning of the decision, it was expected that the members of the voluntary disaster prevention organization and the person in charge of the disaster prevention group would be able to manage all of the measurement equipment without any difficulty from the installation of the measurement equipment if the measurement was performed once a month. However, in practice, measurement and monitoring were hardly performed, and the measurement and monitoring system was hardly functioning. One of the reasons for this is that in the method of "measuring/monitoring and recording when the designated person is decided", extra tasks are imposed on the appointed person, although it is a part of disaster prevention activities. This means that even if residents are working on it at first, they will gradually feel burdened, which will lead to reduced motivation.

Door-To-Door Survey for Residents

After installation of OSV measurement equipment and briefing for members of the voluntary disaster prevention organization, on June 24, 2018, along with disaster prevention drills in Fukui City, explanations and tours for slope observation and monitoring were held for residents. Informed the residents of the intention of the "resident participation-type of slope measurement and monitoring". After that, we visited Takasu Town regularly to check the status of measurement and monitoring, and also conducted interviews with residents to extract the current problems of measurement and monitoring.

In particular, in the door-to-door survey conducted on October 12–13, 2018, some positive and negative responses from nine people were obtained as follows;

- "For simple observation equipment, POCKET and line of sight are easy to observe and understand visually."
- "SOP is easy to understand the principle of measurement, but it is difficult to handle."
- "It still don't know if slope monitoring/measurement really helps to reduce sediment-related disaster."

Some women in their 80s found a sense of mission and joy in observation activities. She observed the steep slope behind her home at the SOP every time it rained, and she was "prideful of her grandchildren." This is a good example of a very positive willingness to the newly assigned role. In addition, a mobile co-op sales car visits the village twice a week in front of elementary school. Some residents are observing at the timing. In this way, by grasping the behavior pattern and rhythm of life of the residents in the town in more detail, in addition to the above, daily observations such as watching observation equipment when walking near the equipment in addition to walking dogs and field work. It turns out that there are a several inhabitants who can reasonably observe slope monitoring in their daily lives. In addition, as long as these changes were observed, it was found that the resident-based slope observation system could take root and have the potential to "make habits (daily routine)" in the future.

Management of Observation Records Using IC Card Reader

Regarding the method of recording observation results, some people commented that the handwritten measurement record in ledger at the beginning of the installation. Significant simplification was required so that measurement and monitoring could be performed frequently. Therefore, management of observation records using an IC cards and a card reader was examined (see Fig. 7a).

In the observation, for all OSV measuring equipment, the observer hold IC cards printed “normal” or “abnormal” as observation results over the card readers that placed near the OSV measuring equipment.

As for the POCKET installed behind the elementary school, if at least one of the three POCKETs displayed yellow or red, it was determined that there was an abnormality. A pair of IC cards will be distributed to the members of the “Takasu voluntary slope observation team” as described in the next section. At the same time, an IC card was also placed near the measuring equipment so that residents other than the members of the observation team could observe. A 12-digit ID is engraved on the IC card, and by associating the card ID with the distribution destination, observation records (“who” measured “when”) can be stored and managed.

The recording of observation results using an IC card and a card reader started on April 27, 2019. In the future, it is necessary to collect and analyze observation records and examine how to link slope measurement and monitoring to “daily routine” and “voluntary/proactive involvement”.

Formation of “Takasu Voluntary Slope Observation Team”

As mentioned in the previous section, there are some residents in Takasu Town who can reasonably observe slope and be involved in monitoring slope in their daily life. They will play a central role in slope measurement and monitoring. Specifically, a total of four women, including the 80-year-old woman mentioned above, a woman of the local welfare officer who is familiar with the situation in Takasu Town, and women who has an interest in measurement and monitoring due to the slope behind their home was formed as a member of the “Takasu voluntary slope observation team”. Ask the four women mentioned above to always carry their personal IC cards (a pair of “normal” and “abnormal”) and walk around the measuring instruments installed in the town. When they passed, they observed the slope and recorded the observation results using IC card readers.

Fig. 7 **a** IC cards printed “normal” and “abnormal” and IC card reader, **b** “Takasu voluntary slope observation team -three hints” and **c** a card reader handling manual

Fig. 8 The formation and appointment ceremony of the “Takasu voluntary slope observation team” was held at the Takasu town village center

On April 27, 2019, the formation and appointment ceremony of the “Takasu voluntary slope observation team” was held at the Takasu Town Village Center (see Fig. 8). Along with the letter of appointment, “Takasu voluntary slope observation team-Three Hints”, a card reader handling manual (see Figs. 7b and c) was distributed, and the method of observing slopes and recording the observation results were confirmed on site.

Communication of Disaster Prevention Information by “handmade Newspaper Takasu-Ikusu”

In this study, together with measurement and monitoring of hazardous slopes, university students handed out handmade newspaper called “Takasu-Ikasu” and distributed it to residents about once a month (until the 15th issue as of the end of June 2019). “ To improve the awareness of disaster prevention and the ability of local disaster prevention. “Takasu-Ikasu (which means take advantage of the wisdom passed down in Takasu Twon)” contains not only articles related to disaster prevention activities, but also information on the charm of Takasu Town and the wisdom of life rooted in the community. Figure 9 shows the pages of Nos. 14 and 15 issued in June 2019. In the 14th issue, the appointment ceremony of the “Takasu voluntary slope observation team” and the method of confirming the safety of the slope were described. In the 15th issue, the explanation of POCKET installed on the block retaining wall at the back of the elementary school gymnasium and the observation method were described. In the future, we would like to publish other


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たかす いかす
第14号
関西大学社会安全学部 近藤研究室・小山研究室
この「たかすいかす」では、自然豊かな高須（たかす）の“暮らしの知恵”を生かしながら（いかす）、防災に関する情報を少しずつ共有していきたいと思います。いっぽいっぽ、たゆまずあゆみましょう。
「安心」の記録を残しましょう！！
集落内のあちこちで、崖の様子を観測しています。異変を把握したら、行政に伝えたり、早めに避難したりするためです。
観測機器の近くには、ポストを設置しています。この中には読み取り機器・カード・説明書が入っています。異変がなければ青のカード、異変を感じたら赤のカードをかざして、記録を残してください。みんなの力で、高須に安心を！
＼ピッ／
小学校の体育館裏のポストの様子
「高須あんしん感測隊」任命式（4月27日）
掃部さん、堀川さん、旭さん、橋本さんを「高須あんしん感測隊」の隊員に任命しました。
「高須あんしん感測隊」は、暮らしのなかで異変を感じとる「感測」を目指しています。ぜひ、4人の隊員だけでなくより多くの人の目で、異変（前兆現象）をキャッチしましょう。
感測用のノートをふたりで手作りしました^o^/
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第15号
関西大学社会安全学部 近藤研究室・小山研究室
この「たかすいかす」では、自然豊かな高須（たかす）の“暮らしの知恵”を生かしながら（いかす）、防災に関する情報を少しずつ共有していきたいと思います。いっぽいっぽ、たゆまずあゆみましょう。
プールの大掃除、がんばりました！
防火水槽に活用できるケロ
小学校裏の観測機器をご紹介します
♪ 小学校の体育館裏には、観測機器が、斜面に3つ設置されています。
♪ 斜面に異常がなければ、「緑色」のランプが点滅しています。そして何らかの異変があれば「オレンジ」・「赤色」に変わります。
♪ 異変を見つけたら自治会長さんまでご連絡ください！
異常なし
これが3台配備
初訪問メンバーも大勢おせわになりました
暑い中で熱い作業になりましたが、高須のパワーをたくさん頂きました！また、うかがいます ^o^/

Fig. 9 Handmade newspaper called “Takasu-Ikasu”, **a** Nos. 14 and **b** 15 issued in June 2019

OSV observation equipment (SOP and see through poles) in the same way so that many residents can be aware of it and encourage them to take an active part in measurement and monitoring.

Concluding Remarks

In this paper, the resident participation-type slope measurement/monitoring system using OSV sensors was developed and introduced to in Takasu Town, Fukui City, Japan. Although OSV measurement equipment was able to achieve "visualization" of the danger of slopes, "daily routine" and "voluntary/proactive involvement" were still issues, and more residents worked on measurement and monitoring on a daily basis. Also it is necessary to further improve the environment and mechanism for receiving the information. In addition, if the residents become aware of unusual events, it is necessary to improve communication with specialists and shift to a method of quantitatively measuring slope deformation. In the future, while monitoring the activities of the "Takasu voluntary slope observation team", quantitatively assess how the transmission of disaster prevention information through the "handmade newspaper Takasu-Ikasu" will contribute to the improvement of residents' disaster prevention awareness and local disaster prevention capabilities. We would like to pursue a detailed analysis and finally aim to establish a "resident participation-type slope measurement/monitoring system (Takasu model)".

References

Akutagawa S (2017) A method for visualizing deformation by manipulating light sources and its path. Civil Eng Life 72(9):94–98

Fukui City (2020) Demographics of Fukui City. https://www.city.fukui.lg.jp/sisei/tokei/jinko/jinkoutoukei.html. Accessed 15 March 2020

OSV conthosium (2020) Sensors used in OSV. https://www.osv.sakura.ne.jp/en/index.html. Accessed 15 March 2020

Toyosawa Y, Itoh K, Tamrakar SB, Araki T, Kunimi T, Nishijyoh A, Ohkubo S (2007) A study on prediction of slope failure using highly accurate tilt-sensor. Specific Research Reports of the National Institute of Occupational Safety and Health, JNIOSH-SRR-NO. 35: 91–106

Yamori K (2017) Recommendation of everyday-life preparedness of natural disasters. Nakanishiya-Syuppan, Kyoto. (ISBN-13: 978-4-7795-0570-6). 107