94% Unique

Total 17423 chars, 2592 words, 103 unique sentence(s).

Results	Query	Domains (original links)
Unique	The sub-basin threshold area was 500 ha	-
Unique	Kanjimbashi was selected as the outlet of the whole basin	-
Unique	Kase River Basin is located in the center part of Saga Prefecture	-
Unique	This basin consists of 3 cities including Saga City	-
Unique	mgt Sol_K Saturated hydrolic conductivity of first layer	-
Unique	sol ESCO Soil Evaporation compensation coefficient	-
2 results	hru Sol_AWC Available water capacity of the soil layer	sciencedirect.com ejournal.unsrat.ac.id
Unique	Finally the result of dam’s management can be assessed	-
Unique	SWAT is a basin or watershed scale model with strong physical mechanism	-
Unique	It has been widely applied in Canada and North America	-
2 results	This version integrates the newest version of Soil and Water Assessment Tool	library.jsce.or.jp ejournal.unsrat.ac.id
2 results	This model was chosen because it was physically based and computationally efficient (Neitsch, 2002)	library.jsce.or.jp ejournal.unsrat.ac.id
Unique	The SWAT model uses the SCS curve number procedure to calculate the runoff volume	-
Unique	The sub-basin threshold area was 500 ha	-
Unique	Kanjimbashi was selected as the outlet of the whole basin	-
Unique	The further simulations were done by adjusting the minimum monthly outflow	-
Unique	The ranges of these parameters were obtained from the SWAT manual (Neitsch et al	-
Unique	”If the correlation coefficient and NSEC coefficient are 1.0, the model prediction is considered “perfect	-

3 results	" Each of these categories followed the criteria used by Santhi et al	gi.org gi.org ijera.com
Unique	The simulations were done by adjusting the minimum monthly outflow rate	-
Unique	In this study, the water management operation of dams done with the SWAT model	-
Unique	It will purpose in Kase River Catchment in Saga, Japan	-
Unique	Large area hydrologic modeling and assessment – Part 1: model development	-
Unique	Journal of the American Water Resources Association 34 (1), 73–89.2) 1998	-
Unique	Bartholow JM, Campbell SG, Flug	-
3 results	Predicting the thermal effects of dam removal on the Klamath River [J]	scribd.com academia.edu ckyyb.crsri.cn
Unique	Environmental Management, 2004 Berkamp G, McCartney M, Dugan P, et al	-
Unique	Dams, ecosystem functions and environmental restoration, WCD thematic review environmental issues II.1	-
Unique	Cape Town: the World Commission on Dams, 2000	-
8 results	Japan Commission on Large Dams	jcold.sakura.ne.jp jcold.or.jp jcold.or.jp eolss.net it.wikipedia.org
2 results	Dams in Japan: Past, Present and Future	jsde.jp it.wikipedia.org
Unique	The Nederlands: CRC Press, 2009	-
Unique	V., River flow forecasting through conceptual models: Part 1 – a discussion of principles	-
Unique	Journal of Hydrology 10 (3), 282–290	-
29 results	Annual Journal of Hydraulic Engineering, JSCE, Vol.56, 2012	researchgate.net researchgate.net ecohyd.dpri.kyoto-u.ac.jp academia.edu pdffiller.com jkuat.ac.ke pdffiller.com fa.depe.titech.ac.jp jkuat.ac.ke repository.unhas.ac.id
Unique	The International Conference on Environmentally Friendly Civil Engineering Construction and Materials Manado, Indonesia, 13	-
Unique	Supit 1 , Isri Ronald Mangangka 2 , Sukarno 3 and Audy Supit 4 1,2,3	-
Unique	Information System interface of the SWAT2009 version was used to develop the SWAT model of	-
Unique	SWAT has a reservoir module, in which the reservoir is treated as an independent	-
Unique	Therefore, it is appropriate for simulating the influence of the hydrological cycle in	-
Unique	The catchment was divided into 23 sub-basins according to hydrologic stations, the position of	-
Unique	use overlay in the sub- basins , is the minimum calculative smallest unit of hydrologic	-
Unique	With a threshold value of 5% for land use and soil types, the total	-

Unique	for preventing eutrophication at the creek network downstream area and also 18.6 m3/s for agriculture	-
Unique	on its social functions, such as flood control, electricity generation, water supply, irrigation, and aquaculture	-
Unique	Along with increased human activities in Kase River basin the demand of water have	-
Unique	The population in the basin about 130,000 people mostly concentrated on the inside and	-
Unique	Kase River dam with Hokuzan dam sequentially in this area in order to supply water	-
Unique	In addition, there has been an open channel network, which is a creek network	-
Unique	This network could enhancement a need of water for irrigation and also could store	-
Unique	irrigation or urban drainage and shortage of water discharge caused eutrophication of water by too	-
Unique	To improve this water environment of the creek network in the plain needs water	-
Unique	The function of dam reservoir for restraining sediment transport including the nutrient causing the	-
Unique	334 Proceedings EFCECM 2014 How the upstream dam reservoirs are utilized is directly or	-
Unique	For that reason, it is fairly essential to reflect on the integrated management of	-
Unique	Managing the water resources in this area became an important topic in the integrated	-
Unique	This basin is very unique with high regulated since some water management such as	-
Unique	creek network downstream, and a discharge of 18.6 m3/s for irrigation period are urgent issue	-
Unique	The purpose of this study is to develop a water management tool of dams	-
Unique	2: Parameter used in the model calibration Name Definition File Name CN2 SCS moisture condition	-
Unique	area, also the water management such as the diversion of water which done inside the	-
Unique	including the diversion of water was setup and dam operation is considered, also the model	-
Unique	Secondly, based on the calibrated model the management model of dams, which will be	-
Unique	ArcSWAT 2009 version of the SWAT model is used as a main tool in	-
Unique	In Japan, the SWAT has been applied to mountain area with enormous success (Supit	-
Unique	It is demonstrated and agreed that SWAT is well established because of its flexibility	-
Unique	SWAT has a reservoir module, in which the reservoir is treated as an	-

	independent	
Unique	Therefore, it is appropriate for simulating the influence of the hydrological cycle in	-
Unique	watersheds with varying soil, land use, and management conditions over long periods of time (Arnold	-
Unique	The hydrologic cycle of the SWAT model is based on the water balance equation,	-
Unique	The volume of outflow calculated using one of four different methods: measured daily outflow,	-
Unique	reservoir outflow, the user must provide a file with the average daily outflow rate for	-
Unique	as the method to calculate reservoir outflow, the reservoir releases water whenever the reservoir volume	-
Unique	2.1 Model Selection and improvement The catchment was divided into 23 sub-basins according to	-
Unique	use overlay in the sub- basins (Neitsch et al.2002), is the minimum calculative smallest unit	-
Unique	With a threshold value of 5% for land use and soil types, the total	-
Unique	added in the model as point source outlet and developed a data based on information	-
Unique	data, As a result, We selected the average annual release rate for uncontrolled reservoir method	-
Unique	water (RES_EVOL) as the water level reaches the emergency spillway and surface area of reservoir	-
Unique	As a result, We set the outflow simulation code to the measured monthly outflow	-
Unique	res), generate and added the minimum monthly outflow rate and read into SWAT for run	-
Unique	Figure 2: Hydrologic Response Unit analysis in SWAT Figure 3: Observed and simulated discharge	-
Unique	337 3 RESULTS AND DISCUSSION 3.1 Model evaluation Four sensitive parameters that may have	-
Unique	The hydrologic parameters were calibrated to match the simulated and observed monthly flow data	-
Unique	Several evaluation indices, including correlation determination (R2), and Nash–Sutcliffe coefficient, were used to evaluate	-
Unique	For the runoff simulation, if the correlation coefficient and NSEC coefficient are 0.0, the	-
Unique	The result simulation show sufficient acceptable of the model with coefficient determination = 0.917,	-
Unique	the irrigation period are the values that must be reach to meet the needs of	-
Unique	Year 2008 and 2009 are selected to analyze the management operation of dams of	-
Unique	before the irrigation period, minimum outflow rate 19 m3/s in the irrigation period, and minimum	-

Unique	5m3/s before the irrigation period, minimum outflow rate 19 m3/s in the irrigation period, and	-
Unique	irrigation period enhanced the fluvial fluidity and was useful to prevent the accumulation of pollutant	-
Unique	Moreover, increasing water discharge during the irrigation period ensured the flood control safety during	-
Unique	The operation of dams involves always keeping them closed in the non flood season	-
Unique	5 m3/s for preventing eutrophication at the creek network and 18.6 m3/s are more than	-
Unique	During the flood season, however, Hokuzan dam usually open to discharge water for flood	-
Unique	By the scenario for uncontrolled dam minimum outflow rate, the water resources quantity was	-
Unique	the stream flow not enough to meet the demand for downstream area, which need more	-
Unique	for the creek network downstream area and also 18.6 m3/s for agriculture purpose after the	-
Unique	improve water quality, while runoff will be reached in irrigation season to satisfy the demand	-
Unique	outlet Figure 5: Monthly simulated runoff 2 dam (controlled) scenarios at Kanjinbashi outlet for 2008-2009Supit,	-
Unique	339 4 CONCLUSIONS Managing water resources is an important research topic in the integrated	-
Unique	The simulation for managing water resources was done by adjusting the minimum outflow rate	-
Unique	By the scenario for uncontrolled dam minimum outflow rate, the water resources quantity was	-
Unique	for preventing eutrophication at the creek network downstream area and also 18.6 m3/s for agriculture	-
Unique	irrigation period enhanced the fluvial fluidity and was useful to prevent the accumulation of pollutant	-
Unique	Moreover, increasing water discharge over 18.6 m3/s during the irrigation period ensured the flood	-
Unique	for 5 m3/s for preventing eutrophication problem at the creek network downstream area and the	-
Unique	water management operation of dams and will be a very useful method for future integrated	-
Unique	National Land Survey Division, Land and Water Bureau of Ministry of Land, Infrastructure, Transport	-
Unique	jp/tockok/index.html Supit C, Ohgushi K, Prediction of dam construction impacts on annual and peak flow	-

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The International Conference on Environmentally Friendly Civil Engineering Construction and Materials Manado, Indonesia, 13 – 14 November 2014 Supit, C. J. Mangangka, I. R. Sukarno and Supit, A. 333 □□□□□□□□ □□□ □ WATER RESOURCES MANAGEMENT BY MODELING OF DAM OPERATION Cindy Jeane Supit 1 , Isri Ronald Mangangka 2 , Sukarno 3 and Audy Supit 4 1,2,3 Sam Ratulangi University, Dept. of Civil Engineering, Indonesia 4 Manado State Polytechnic, Indonesia e-mail: cindysupit@yahoo.com ABSTRACT The Arc-Geographic Information System interface of the SWAT2009 version was used to develop the SWAT model of Kase River Catchment. SWAT has a reservoir module, in which the reservoir is treated as an independent unit to be added in the corresponding sub basin. Therefore, it is appropriate for simulating the influence of the hydrological cycle in a region with reservoirs, such as our study basin. The catchment was divided into 23 sub-basins according to hydrologic stations, the position of dams, the water diversion point, and the discharge zones. The sub-basin threshold area was 500 ha. Kanjimbashi was selected as the outlet of the whole basin. The hydrologic response unit (HRU), which is a unique combination of soil and land use overlay in the sub- basins , is the minimum calculative smallest unit of hydrologic process. With a threshold value of 5% for land use and soil types, the total number of HRUs was 356. By scenario analysis for controlled the minimum outflow rate from Hokuzan dam and Kase River dam, the water resources quantity improved and satisfied the demand water of 5 m3/s for preventing eutrophication at the creek network downstream area and also 18.6 m3/s for agriculture purpose after the implementation of water management operation of dams. KEYWORDS: Water Resources Management, Dam Operation 1 INTRODUCTION Dam design and operation typically focuses on its social functions, such as flood control, electricity generation, water supply, irrigation, and aquaculture (WCD 2000). Along with increased human activities in Kase River basin the demand of water have become more apparent in recent years. Kase River Basin is located in the center part of Saga Prefecture. This basin consists of 3 cities including Saga City. The population in the basin about 130,000 people mostly concentrated on the inside and the downstream part. The basin has wide variety of land use while MLIT (Ministry of Land, Infrastructure and Transportation) Japan due to National Comprehensive Water Resources Plans was added a new multi-purpose Kase River dam with Hokuzan dam sequentially in this area in order to supply water needed especially for agriculture and water supply in Saga Prefecture. In addition, there has been an open channel network, which is a creek network in Saga Plain. This network could enhancement a need of water for irrigation and also could store up the water when flood occurred. However after achievement of water supply facilities, the creek network was used only for irrigation or urban drainage and shortage of water discharge caused eutrophication of water by too much nutrient supply and polluted sediment settled down the channel. To improve this water environment of the creek network in the plain needs water quantity to some extent. The function of dam reservoir for restraining sediment transport including the nutrient causing the eutrophication in the downstream open channel is expected. 334 Proceedings EFCECM 2014 How the upstream dam reservoirs are utilized is directly or indirectly related to water quantity and quality in the downstream area. For that reason, it is fairly essential to reflect on the integrated management of dam reservoir in this watershed. Managing the water resources in this area became an important topic in the integrated basin management to provide a new approach to water environment improvement. This basin is very unique with high regulated since some water management such as the water diversion from downstream of Hokuzan dam to Ayunose was done in this area. A water demand for sufficiently quantity by 5 m3/s to prevent eutrophication at the creek network downstream, and a discharge of 18.6 m3/s for irrigation period are urgent issue to answer community needs. The purpose of this study is to develop a water management tool of dams operation, at the basin scale, based on SWAT. Figure 1: Watershed delineation in the watershed with 2 dams, 3 precipitation stations Table 2: Parameter used in the model calibration Name Definition File Name CN2 SCS moisture condition II curve number for pervious areas .mgt Sol_K Saturated hydrolic conductivity of first layer .sol ESCO Soil Evaporation compensation coefficient .hru Sol_AWC Available water capacity of the soil layer .solSupit, C. J. Mangangka, I. R. Sukarno and Supit, A. 335 2 METHODOLOGY In order to develope the water management tools of dams operation, at the basin scale, it is necessary to recognize the problem that facing in this area, also the water management such as the diversion of water which done inside the watershed. Our research framework is that: Firstly, distributed hydrological and water quality model are developed including the diversion of water was setup and dam operation is considered, also the model parameters are calibrated in order to well simulated the process under current situation. Secondly, based on the calibrated model the management model of dams, which will be developed to reach objective. Finally the result of dam’s management can be assessed. ArcSWAT 2009 version of the SWAT model is used as a main tool in this study. SWAT is a basin or watershed scale model with strong physical mechanism. It has been widely applied in Canada and North America . In Japan, the SWAT has been applied to mountain area with enormous success (Supit et al. 2012). It is demonstrated and agreed that SWAT is well established because of its flexibility and suitability for hydrological simulation in complex basins and water resources management. SWAT has a reservoir module, in which the reservoir is treated as an independent unit to be added in the corresponding subbasin. Therefore, it is appropriate for simulating the influence of the hydrological cycle in a region with reservoirs, such as our study basin. This version integrates the newest version of Soil and Water Assessment Tool. The SWAT is a river basin or watershed, scale model developed to predict the impact of land management practices on water, sediment, and agriculture chemical yields in large, complex watersheds with varying soil, land use, and management conditions over long periods of time (Arnold et.all 1998). This model was chosen because it was physically based and computationally efficient (Neitsch, 2002). The hydrologic cycle of the SWAT model is based on the water balance equation, which considers the unsaturated zone and shallow aquifer above the impermeable layer as a unit. The SWAT model uses the SCS curve number procedure to calculate the runoff volume. The volume of outflow calculated using one of four different methods: measured daily outflow, measured monthly outflow, average annual release rate for uncontrolled reservoir, controlled outflow with target release. When measured monthly outflow (IRESCO = 1) is chosen as the method to calculate reservoir outflow, the user must provide a file with the average daily outflow rate for every month the reservoir is simulated in the watershed. The volume of outflow from the reservoir is then calculated using equation V flowout = 86400 @ qout When the average annual release rate (IRESCO = 0) is chosen as the method to calculate reservoir outflow, the reservoir releases water whenever the reservoir volume exceeds the principal spillway volume, Vpr. 2.1 Model Selection and improvement The catchment was divided into 23 sub-basins according to hydrologic stations, the position of dams, the water diversion point, and the discharge zones. The sub-basin threshold area was 500 ha. Kanjimbashi was selected as the outlet of the whole basin. The hydrologic response unit (HRU), which is a unique combination of soil and land use overlay in the sub- basins (Neitsch et al.2002), is the minimum calculative smallest unit of hydrologic process. With a threshold value of 5% for land use and soil types, the total number of HRUs was 356 (Fig.1). Moreover, water diversion that supply water in pipe to Ayunose in the catchment was added in the model as point source outlet and developed a data based on information from the water 336 Proceedings EFCECM 2014 use in this diversion. For run the first simulation Hokuzan dam and Kase River dam have no monitoring data, As a result, We selected the average annual release rate for uncontrolled reservoir method (IRESCO=0) in their control files (*.res), and modified the reservoir's design data including reservoir surface area (RES_ESA) and volume of water (RES_EVOL) as the water level reaches the emergency spillway and surface area of reservoir (RES_PSA), and volume of water (RES_PVOL) in their control files (*.res). The further simulations were done by adjusting the minimum monthly outflow. As a result, We set the outflow simulation code to the measured monthly outflow (IRESCO = 1) in their control files (*.res), generate and added the minimum monthly outflow rate and read into SWAT for run the simulation. Figure 2: Hydrologic Response Unit analysis in SWAT Figure 3: Observed and simulated discharge simulation Supit, C. J. Mangangka, I. R. Sukarno and Supit, A. 337 3 RESULTS AND DISCUSSION 3.1 Model evaluation Four sensitive parameters that may have a potential influence on river flow was selected (Table 1) (Arnold et al. 1998). The ranges of these parameters were obtained from the SWAT manual (Neitsch et al. 2002). The hydrologic parameters were calibrated to match the simulated and observed monthly flow data at Kanjinbashi outlet from 2008 to2009. Several evaluation indices, including correlation determination (R2), and Nash–Sutcliffe coefficient, were used to evaluate the model performance (Romanowicz et al.2005) (Fig. 4). For the runoff simulation, if the correlation coefficient and NSEC coefficient are 0.0, the model prediction is considered "unacceptable or poor."If the correlation coefficient and NSEC coefficient are 1.0, the model prediction is considered "perfect." Each of these categories followed the criteria used by Santhi et al. (2001). The result simulation show sufficient acceptable of the model with coefficient determination = 0.917, and Nash Sutcliffe =0.882. 3.2 Management dam operation Currently the demand of water for preventing eutrophication at the open channel in downstream area is 5 m3/s, and a discharge over 18.6 m3/s in the irrigation period are the values that must be reach to meet the needs of community. The simulations were done by adjusting the minimum monthly outflow rate. Year 2008 and 2009 are selected to analyze the management operation of dams of the SWAT model. The management option of Hokuzan dam is as follows: minimum outflow rate by 5m3/s before the irrigation period, minimum outflow rate 19 m3/s in the irrigation period, and minimum outflow rate 5 m3/s after the irrigation period. The management option of Kase River dam is as follows: minimum outflow rate by 5m3/s before the irrigation period, minimum outflow rate 19 m3/s in the irrigation period, and minimum outflow rate 5 m3/s after the irrigation period. Conclusively, with the water discharge over 5 m3/s of dams before and after the irrigation period enhanced the fluvial fluidity and was useful to prevent the accumulation of pollutant or nutrient at the creek network, which would have decreased the water quality. Moreover, increasing water discharge during the irrigation period ensured the flood control safety during the flooding season and satisfied the demand for agriculture purpose. The operation of dams involves always keeping them closed in the non flood season to store water for irrigation. The quantity of usable water resources is problem in Saga Plain since water demand 5 m3/s for preventing eutrophication at the creek network and 18.6 m3/s are more than available natural supply. During the flood season, however, Hokuzan dam usually open to discharge water for flood irrigation. By the scenario for uncontrolled dam minimum outflow rate, the water resources quantity was not satisfied along the years. In January, February, July, August and September for 2008, and March, September for 2009, the stream flow not enough to meet the demand for downstream area, which need more supply water. By scenario analysis for controlled the minimum outflow rate from Hokuzan dam and Kase River dam, the water resources quantity improved and satisfied the demand water of 5 m3/s for the creek network downstream area and also 18.6 m3/s for agriculture purpose after the implementation of water management operation of dams. The runoff increased in the non irrigation season to increase fluidity of rivers and improve water quality, while runoff will be reached in irrigation season to satisfy the demand for that time. Figure 4: performances of simulated and observed discharges in Kanjinbashi outlet Figure 5: Monthly simulated runoff 2 dam (controlled) scenarios at Kanjinbashi outlet for 2008-2009 4 CONCLUSIONS Managing water resources is an important research topic in the integrated basin management and will provide a new approach to water environment improvement. In this study, the water management operation of dams done with the SWAT model. The simulation for managing water resources was done by adjusting the minimum outflow rate in reservoir module and read into SWAT. By the scenario for uncontrolled dam minimum outflow rate, the water resources quantity was not satisfied along the years. By scenario analysis for controlled the minimum outflow rate from Hokuzan dam and Kase River dam, the water resources quantity improved and satisfied the demand water of 5 m3/s for preventing eutrophication at the creek network downstream area and also 18.6 m3/s for agriculture purpose after the implementation of water management operation of dams. Conclusively, with the water discharge over 5 m3/s of dams before and after the irrigation period enhanced the fluvial fluidity and was useful to prevent the accumulation of pollutant or nutrient at the creek network, which would have decreased the water quality. Moreover, increasing water discharge over 18.6 m3/s during the irrigation period ensured the flood control safety during the flooding season and satisfied the demand for agriculture purpose. The management of dam operation at the basin scale answers the demand of water for 5 m3/s for preventing eutrophication problem at the creek network downstream area and the discharge over 18.6 m3/s for irrigation, using the reservoir operation module of SWAT model. It will purpose in Kase River Catchment in Saga, Japan. Although this paper still a preliminary study, and the results were not very satisfying due to limitations in available observation data, this model provides technical support and reference for water management operation of dams and will be a very useful method for future integrated basin improvement.. 5 REFERENCES Arnold, J.G., Srinivasan, R., Muttiah, R.S., Williams, J.R., 1998. Large area hydrologic modeling and assessment – Part 1: model development. Journal of the American Water Resources Association 34 (1), 73–89.2) 1998. Bartholow JM, Campbell SG, Flug M. Predicting the thermal effects of dam removal on the Klamath River [J]. Environmental Management, 2004 Berkamp G, McCartney M, Dugan P, et al. Dams, ecosystem functions and environmental restoration, WCD thematic review environmental issues II.1. Cape Town: the World Commission on Dams, 2000. Japan Commission on Large Dams. Dams in Japan: Past, Present and Future. The Nederlands: CRC Press, 2009. Nash, J.E., Sutcliffe, J.V., River flow forecasting through conceptual models: Part 1 – a discussion of principles. Journal of Hydrology 10 (3), 282–290. 1970. National Land Survey Division, Land and Water Bureau of Ministry of Land, Infrastructure, Transport and Tourism (2007), http://tochi.mlit.go.jp/tockok/index.html Supit C, Ohgushi K, Prediction of dam construction impacts on annual and peak flow rates in Kase River Basin. Annual Journal of Hydraulic Engineering, JSCE, Vol.56, 2012