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Water Use Efficiency Strategy for the Universitas Trisakti FTSP Building

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WATER USE EFFICIENCY STRATEGY FOR THE UNIVERSITAS TRISAKTI FTSP BUILDING

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Abstract. Buildings play a significant role in green development. FTSP Building at Universitas Trisakti aims to implement Green Buildings. Water efficiency contributes 13% to the green buildings criteria. To determine efficiency and strategies for improving water usage, water balance calculations were performed using the Ministry of PUPR Water Balance Software v2.6. Strategies were tested through 72 simulations, each replacing a component to identify the most impactful factor on the FTSP building's water efficiency. The water efficiency of the FTSP building aims at conserving PDAM water resources. The simulations revealed that the most influential components for water efficiency in the FTSP building are the water system and faucets. Adopting a system that uses rainwater and treated used water for non-potable needs, recycling black water for toilets/flushing, and installing water-saving faucets on FTSP can reduce the water efficiency of PDAM from 4% to 78.9% on dry days and 100% on rainy days if supported by various factors. The assessment points increased from 9 to 15 out of 22 points. Further testing is needed to accurately implement this strategy in the FTSP building.

1. Introduction

Population growth affects the decline of water resources [2] Currently, clean water is needed by the community. The average use of clean water in Indonesia is around 80-150 liters/person-day [10,4]. Water crises will occur in the future if we ignore the efficiency of water use, especially in buildings. The 2020 National Development Planning Agency (Bappenas) report states that the availability of water will enter a scarce to crisis status with the percentage of water crisis areas from 6% in 2000 to 9.6% in 2045 [1].

Regarding this, buildings have a great contribution to water consumption, because buildings are built as a place for human activities. One way to conserve water so that there is no water crisis in the future is to implement green building. Universitas Trisakti FTSP Building is a lecture building consisting of 11 floors (including 1 basement and 1 roof floor) that seeks to implement a green building, one of the supporting factors of green building is the efficiency of water use. Water use efficiency contributes 13% to the green building criteria. To determine the amount of water use efficiency, a water balance calculation is needed. By applying the water balance approach, it's feasible to calculate each element of the water balance [5]. The author calculates the water balance using the water balance software v2.6 of the Ministry of PUPR to determine the efficiency and strategies to improve the efficiency of water use in the FTSP building of Universitas Trisakti.

2. Method

2.1 Research Data Collection

The research methods used are observation, documentation, interviews, and quantitative calculations using the Water Balance Calculation Worksheet V2.6 2023 software issued by the Ministry of PUPR and do the assessment points are determined based on Minister of PUPR No. 01/SE/M/2022 from data on the current condition of Universitas Trisakti FTSP building which is compared with the calculation after the simulation of the efficiency improvement strategy as many as 72 times to find out the most influential component in the efficiency of PDAM water use and find the best strategy to improve the efficiency of water use in the Universitas Trisakti FTSP building. The steps in applying Water Balance Software v2.6 include: (a) feed building information, (b) key in water system options, (c) input data on sanitary water equipments, (d) enter water source data, (e) perform water balance calculators and (f) make a water schematic.

In calculating the water balance, a 95 percentile rainfall calculation is needed using rainfall data for the last 10 years at the nearest rain station from the BMKG website. Rainfall of 95 percentile was obtained based on PERMEN PU No.11, 2014. In addition to 95 percentile rainfall, the calculation of the water balance also requires data on the area of green vegetation area, rainwater storage, and air conditioning capacity data.

Table 1. Runoff Coefficient

Land Description/Surface Characteristics	Runoff Coefficient
Roof	0.75 – 0.95
Yard, sandy soil	
- Flat 2%	0.05 - 0.1
- Average, 2-7%	0.1 - 0.15
- Steep 75%	0.15 - 0.2
Yard, heavy soil	
- Flat 2%	0.13 – 0.17
- Average (2-7%)	0.18 – 0.22
- Steep (7%+)	0.25 – 0.35
Railway yards	0.1 – 0.35
Parks, playgrounds	0.2 – 0.35
Parks, cemeteries	0.1 – 0.25
Forests	
- Flat (0-5%)	0.1 – 0.4
- Rolling (5-10%)	0.25 – 0.5
- Hilly (10-30%)	0.3 – 0.6

(Source :Anggita Aprilia Cahyani ,2022)

3. Water Balance Calculation

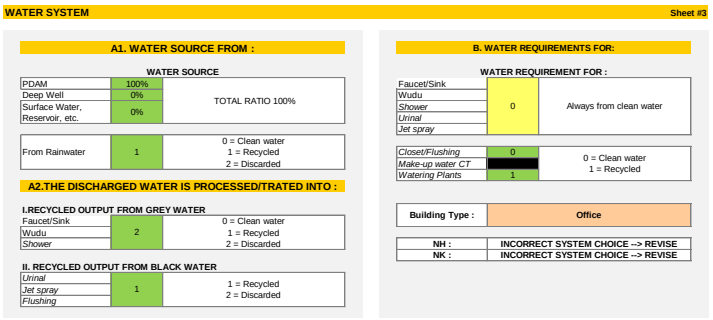
3.1 Calculation of Water Efficiency with actual data on the current condition of the FTSP Building at Universitas Trisakti

BUILDING DATA Sheet #1

Building Name		UNIVERSITAS TRISAKTI FTSP BUILDING	
BUILDING TYPE		Office	Choose from the drop down list
1. *Gross Floor Area* (GFA)	m^2	15.444	
2. Service Area	m^2	1404	From the calculation database / can be changed
3. *Net Lettable Area* (NLA)	m^2	14.040	3) = 1) -2)
5. The number of residents is calculated from the density of residents	Y/N	Y	From the calculation database / can be changed
6. Occupant Density	m2/person	10	Dari data base perhitungan / bisa dirubah
7. Active room area = NLA	m^2	14.040	7) = 3)
8.a) Option-1 : Occupants with a total number of inhabitants	person		Fill in the number of people in the office/hotel guests/hospital beds
b) Option-2: Residents with a density of people		1.404	
c) Number of Residents		1.404	Number of people used for the next time
9. Roof Area	m^2	1.614	
10. Area of Green Vegetation	m^2	641	
11. AC Water Cooled	Y/N	N	
12. Air Conditioning (AC) Capacity	TR		Fill 0 (zero) if not using air conditioning
13. Rain Data : Rainy Days	Ratio - %	45%	From BMKG data
14. Rain Data - Dry Days	Ratio - %	55%	14) = 100% - 13)
15. Operating Hours	hours/day	10	From the calculation database

Water Balance Calculation Worksheet - V2.6 - 2023

Fig.1 FTSP Building Data
(Source: Author, 2024)



WATER SYSTEM — Sheet #3

A1. WATER SOURCE FROM :

WATER SOURCE

PDAM	100%	TOTAL RATIO 100%
Deep Well	0%	
Surface Water, Reservoir, etc.	0%	

From Rainwater	1	0 = Clean water 1 = Recycled 2 = Discarded

A2.THE DISCHARGED WATER IS PROCESSED/TRATED INTO :

I.RECYCLED OUTPUT FROM GREY WATER

Faucet/Sink	2	0 = Clean water 1 = Recycled 2 = Discarded
Wudu		
Shower		

II. RECYCLED OUTPUT FROM BLACK WATER

Urinal	1	1 = Recycled 2 = Discarded
Jet spray		
Flushing		

B. WATER REQUIREMENTS FOR:

WATER REQUIREMENT FOR :

Faucet/Sink	0	Always from clean water
Wudu		
Shower		
Urinal		
Jet spray		

Closet/Flushing	0	0 = Clean water 1 = Recycled
Make-up water CT		
Watering Plants	1	

Building Type :	**Office**

NH :	**INCORRECT SYSTEM CHOICE --> REVISE**
NK :	**INCORRECT SYSTEM CHOICE --> REVISE**

Water Balance Calculation Worksheet - V2.6 - 2023

Fig.2 FTSP Building Water System
(Source: Author, 2024)

SANITARY DATA — Sheet #2

A. FAUCETS / SINKS	Unit	Standard	Design	Percentage of Total	Water Flow
Faucet Sink Specification Brand A	L/min	9	7	16%	2.164
Faucet Sink Specification Brand B	L/min		10	1%	229
Faucet Sink Specification Brand C	L/min		6	4%	430
Faucet Sink Specification Brand D	L/min		6	1%	133
Faucet Sink Specification Brand E	L/min		2	1%	53
Faucet Sink Specification Brand F	L/min		6	1%	70
Faucet Sink Specification Brand G	L/min		9	2%	375
Faucet Sink Specification Brand H	L/min		4	1%	39
Faucet Sink Specification Brand I	L/min		9	5%	894
Janitor Faucet Specification Brand A	L/min		8	1%	89
Janitor Faucet Specification Brand B	L/min		11	1%	122
Janitor Faucet Specification Brand C	L/min		9	1%	199
Janitor Faucet Specification Brand D	L/min		6	1%	70
Janitor Faucet Specification Brand E	L/min		13	1%	139
Janitor Faucet Specification Brand F	L/min		14	2%	472
Water Faucet Specification Brand A	L/min		9	4%	695
Water Faucet Specification Brand B	L/min		10	1%	212
Water Faucet Specification Brand C	L/min		9	12%	2.031
Water Faucet Specification Brand D	L/min		14	9%	2.518
Water Faucet Specification Brand E	L/min		9	4%	701
Water Faucet Specification Brand F	L/min		6	3%	350
Water Faucet Specification Brand G	L/min		11	1%	251
Water Faucet Specification Brand H	L/min		10	2%	335
Water Faucet Specification Brand I	L/min		11	1%	118
Water Faucet Specification Brand J	L/min		10	1%	216
Water Faucet Specification Brand K	L/min		2	1%	21
Laboratory Faucet Specification Brand A	L/min		3	5%	270
Laboratory Faucet Specification Brand B	L/min		7	2%	295
Laboratory Faucet Specification Brand C	L/min		4	1%	43
Laboratory Faucet Specification Brand D	L/min		11	2%	367
Laboratory Faucet Specification Brand E	L/min		10	6%	1.067
Laboratory Faucet Specification Brand F	L/min		11	1%	123
Laboratory Faucet Specification Brand G	L/min		12	1%	129
Kitchen Faucet Specification Brand A	L/min		3	1%	68
Kitchen Faucet Specification Brand B	L/min		5	1%	56
Kitchen Faucet Specification Brand C	L/min		11	1%	245
Kitchen Faucet Specification Brand D	L/min		3	1%	38
Kitchen Faucet Specification Brand E	L/min		1	3%	81
Usage				**100%**	
- Freq of use / day / person	freq / day		4		
Duration of use	minutes		0.3		
Number of people	People		1.404		
Water Consumption	**L/day**	**16.848**	**15.707**		**15.707**

B. WUDU	Unit	Standard	Design	Percentage of Total	Water Flow
Wudu Faucet Spesification Brand A	L/min	8	11	13%	3.309
Wudu Faucet Spesification Brand B	L/min		8	38%	7.223
Wudu Faucet Spesification Brand C	L/min		14	19%	6.395
Wudu Faucet Spesification Brand D	L/min		6	31%	4.744
Usage				**100%**	
- Frequency of prayer-wudu per day / person	freq / day		2		
- Percentage of Muslims	%		85%		
- Duration of use	minutes		1		
- Number of people	People		1.404		
Water Consumption	**L/day**	**19.094**	**21.671**		**21.671**

C. SHOWER	Unit	Standard	Design	Percentage of Total	Water Flow
Hand Shower	L/min	9			0
Usage					
Frequency of showers per day/person	freq / day				
Percentage of people who shower	%				
- Length of use	minutes				
- Number of people	People				
Water Consumption	**L/day**	**0**			

D. *URINAL*	Unit	Standard	Design	Percentage of Total	Water Flow
Urinal Spesification Brand A	L/Flush	**4**	3	100%	7.722
Usage				**100%**	
- Frequency of urinal use	freq / day		4.0		
- Male occupancy	%		55%		
- Number of people	People		1.404		
Water Consumption	**L/day**	**12.355**	**7.722**		**7.722**

E. *JET SPRAY*	Unit	Standard	Design	Percentage of Total	Water Flow
Jet Spray Spesification Brand A	L/min	4	4	10%	1.077
Jet Spray Spesification Brand B	L/min		7	31%	5.490
Jet Spray Spesification Brand C	L/min		5	22%	3.166
Jet Spray Spesification Brand D	L/min		6	24%	3.730
Jet Spray Spesification Brand E	L/min		1	2%	56
Jet Spray Spesification Brand F	L/min		8	10%	2.218
Jet Spray Spesification Brand G	L/min		8	2%	354
				100%	
- Freq of use / day / person	freq / day		1		
Duration of use	minutes		1.5		
Number of people	People		1.404		
Water Consumption	**L/day**	**10.586**	**16.091**		**16.091**

F. *MAKE-UP WATER COOLING TOWER*	Unit	Standard	Design	Percentage of Total	Water Flow
Make-up water	%	2.0%	2.0%		0
Water cooled AC (Y/N)	Y/N		N		
AC Capacity	TR				
Number of AC Operating Hours	hr		10		
Water Consumption	**L/day**	**0**	**0**		**0**

G. WATERING PLANTS (IRRIGATION)	Unit	Standard	Design	Percentage of Total	Water Flow
Plant Irrigation Faucet	L/m^2	5	5	100%	3.205
- Irrigation Frequency	frek/hari		1		
- Land Area	m^2		641		
Water Consumption	**L/day**	**3.205**	**3.205**		**3.205**

H. WC - KLOSET / FLUSHING	Unit	Standard	Design	Percentage of Total	Water Flow
Dual Flush Toilet Spesification Brand A	L/flush	6	5	35%	4.142
Dual Flush Toilet Spesification Brand B	L/flush		5	23%	2.762
Dual Flush Toilet Spesification Brand C	L/flush		5	4%	518
Squat Toilet Spesification Brand A	L/flush		6	26%	4.315
Squat Toilet Spesification Brand B	L/flush		6	12%	1.918
Usage				**100%**	
- Freq of use / day / person	freq / day		1.3		
- Okupansi pengguna	%		1.5		
- Number of people	People		1.404		
Water Consumption	**L/day**	**15.879**	**13.655**		**13.655**

SUMMARY	Unit	Standard	Design		Water Flow
TOTAL WATER CONSUMPTION / DAY = A+B+C+D+E+F+G+H	L/day	**77.968**	**78.051**		**78.051**
TOTAL WATER CONSUMPTION / PERSON	**Liters/person/day**	**56**	**56**		**56**

Fig.3 FTSP Building Sanitary Data
(Source: Author, 2024)

ALTERNATIVE WATER SOURCE

RAINWATER			
Roof Area	m^2		1.614
Average Daily Rainfall	mm/day		70.4
Runoff Factor from Roof	%		95%
Rainwater Harvesting	m^3/day		107.93
Rainwater Harvesting	L/day		107.930

Fig.4 FTSP Building Alternative Water Source
(Source: Author, 2024)

WATER EFFICIENCY CONSUMPTION

EFFICIENCY: (Calculated on Rainy Days):
Baseline/Conventional Water Consumption: 77.968
Planned/Schematic Water Consumption: 74.846 *) From the Rainy Day Balance
Efficiency 3.122 = 4.0%

EFFICIENCY: (Calculated on Dry Days):
Baseline/Conventional Water Consumption: 77.968
Planned/Schematic Water Consumption: 74.846 *) From the Dry Day Balance
Efficiency 3.122 = 4.0%

Fig.5 Water Efficiency of FTSP Building
(Source: Author, 2024)

In Figure 5, the calculation of water consumption of baseline/conventional PDAM using the actual data of the FTSP building assuming the number of residents based on the density of residents and the choice of the nearest rainfall station, namely the Kemayoran meteorological station on dry days and rainy days, results in a PDAM water consumption figure of 77,968 L/day, with the efforts to save PDAM water that has been carried out by the current FTSP building, PDAM water consumption has been reduced to 74,846 L/day so that the FTSP Building has currently saved PDAM water of 3,122 L/day with a percentage of 4% on dry days and rainy days. It is said that the use of PDAM water in the Universitas Trisakti FTSP Building saves 4% of the 100% available PDAM water. This is calculated assuming a 30 per-day calculation to be 2,244 m^3/month.

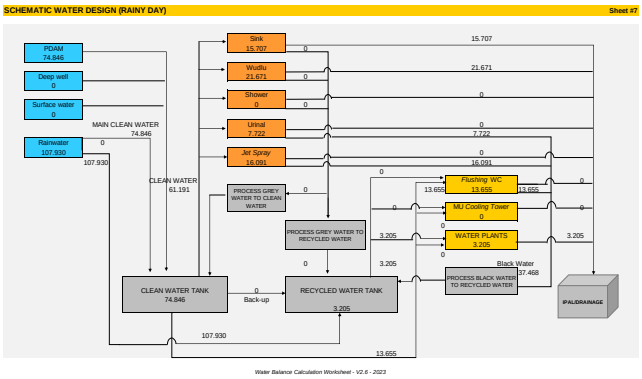


Fig.6 FTSP Building Schematic Water Design (Rainy Day)
(Source: Author, 2024)

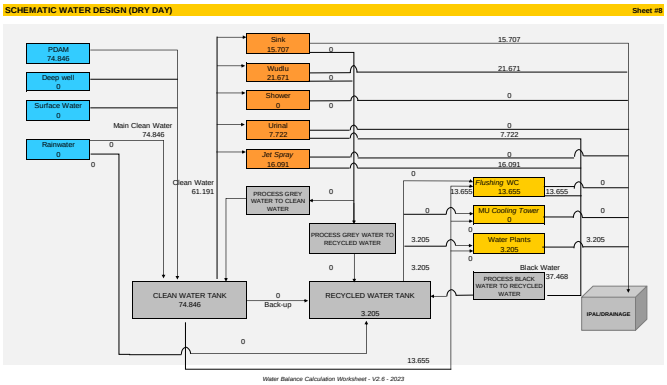


Fig.7 FTSP Building Schematic Water Design (Dry Day)
(Source: Author, 2024)

3.2 Strategy Simulations

To determine the most influential component in the percentage of water efficiency in the Universitas Trisakti FTSP Building, a recalculation was performed 72 simulations by modifying the design of each component to be more water-efficient using Water Balance v2.6 in accordance with Ministry of PUPR No. 01/SE/M/2022.

Table 2. Results of Strategy Simulations (72 times)

Components	Faucet/ Sink	Wudu faucets	Urinal	*Jet Spray*	WC/ *Flushing*	Water System	Efficiency based on dry day water balance	Efficiency based on rainy day water balance
Faucet/ Sink	√	-	-	-	-	-	11%	11%
Wudu Faucets	-	√	-	-	-	-	14,3%	14,3%
Urinal	-	-	√	-	-	-	6,4%	6,4%
Jet Spray	-	-	-	√	-	-	11,1%	11,1%
WC/ *Flushing*	-	-	-	-	√	-	5,2%	5,2%
Water System	-	-	-	-	-	√	69,5%	100%

(Source: Author, 2024)

Faucets/sinks were changed to a design specification of 4.5 Lpm, janitor faucets to a design specification of 5.7 Lpm, and kitchen faucets to a specification of 5.7 Lpm. The water efficiency in the Universitas Trisakti FTSP Building increased to 11.3%. Changing the wudu faucets to a design specification of 5.7 Lpm improved the water efficiency in the FTSP Building to 14.3%.

Changing the urinal to a design specification of 1.9 Lpm increased the water efficiency in the FTSP Building to 6.4%. Replacing the jet spray with a design specification of 4 Lpm resulted in an increase in water efficiency in the FTSP Building to 11.1%. Replacing squat toilets and sit-down toilets with dual flush toilets improved water efficiency in the FTSP Building to 5.2%. The final simulation involved planning changes to the water system choices for the FTSP Building by altering the water sources from initially being PDAM (local water utility) and using rainwater only for occasional plant irrigation on the ground floor, to sourcing from PDAM and processed water from rainwater and greywater converted into clean water, as well as recycled black water. The water needs for faucets/sinks, wudu faucets, showers, urinals, and jet sprays are sourced from clean water, while the water needs for toilets/flushing and plant irrigation come from recycled water. This change in the water system options resulted in a drastic increase in water efficiency for the building, reaching 100% based on the rainy day balance and 69.5% based on the dry day balance.

From this simulation, it was found that the water sanitation component with the highest contribution to water efficiency in the FTSP Building at Universitas Trisakti is the water system, with an efficiency increase of 100% based on the rainy day balance and 69.5% based on the dry day balance. Additionally, the wudu faucet, with an efficiency increase to 14.3%, also significantly contributes to the overall water efficiency.

3.3 Calculation of Water Efficiency with All Simulated Strategy Result

WATER EFFICIENCY CONSUMPTION

EFFICIENCY: (Calculated on Rainy Days):

Baseline/Conventional Water Consumption:		**77.968**		
Planned/Schematic Water Consumption:		**0**		***) From the Rainy Day Balance**
	Efficiency	**77.968**	=	**100.0%**

EFFICIENCY: (Calculated on Dry Days):

Baseline/Conventional Water Consumption:		**77.968**		
Planned/Schematic Water Consumption:		**16.455**		***) From the Dry Day Balance**
	Efficiency	**61.513**	=	**78.9%**

Fig.7 Water Efficiency with All Simulated Strategy Result
(Source: Author, 2024)

After replacing all components with the incorporation of all simulated strategies, water savings of 78.9% were obtained on dry days and 100% on rainy days. It can be said that the use of PDAM water in the FTSP building of Universitas Trisakti saves PDAM water by 78.9% on dry days and 100% on rainy days.

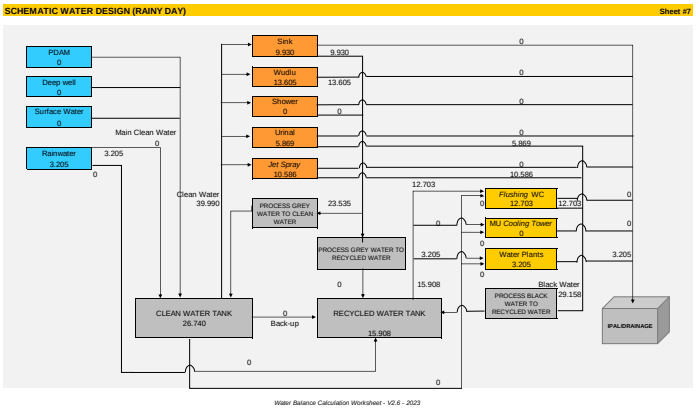


Fig.8 FTSP Building Schematic Water Design with Strategy Calculation (Rainy Day)
(Source: Author, 2024)

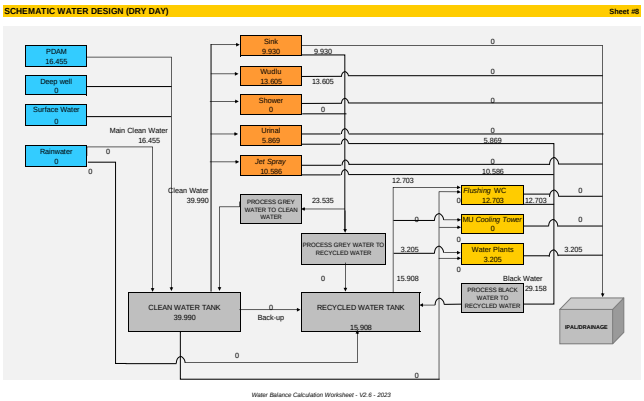


Fig.9 FTSP Building Schematic Water Design with Strategy Calculation (Rainy Day) (Source: Author, 2024)

Table 3. Results with All Strategies

Components	Faucet / Sink	Wudu faucets	Urinal	*Jet Spray*	WC/ *Flushing*	Water System	Efficiency based on dry day water balance	Efficiency based on rainy day water balance
All Strategy	√	√	√	√	√	√	78,9%	100%

(Source: Author, 2024)

4. Assessment Points

4.1 Current Condition

Table 4. Assessment Point of Water Efficiency on Current Condition

No.	Work Assessment	Points	Claimed Points
Assessment Point of Water Sources			
a.	PDAM or other drinking water company	1	1
b.	Surface water (river water, lake water, sea water) treated with permit	3	0
c.	Treated rainwater	2	1
d	Recycled water		
	Recycled water and grey water	2	0
	If equipped with a water meter, additional 1 point	1	0
	Recycled water from black water	3	1
	If equipped with a water meter, additional 1 point	1	0
Assessment Point of Water Consumption			
a.	Installation of a water meter at each groundwater outlet is planned	2	0
b.	Presence of a water consumption savings plan in the form of a water balance	2	2
Assessment Point of Water Fixtures			
a.	The building is planned to use at least 25% water-efficient fixture products of the total fixture procurement plan.	3	
b.	At least 50% of the total fixture procurement.	4	4
c.	At least 75% of the total fixture procurement.	5	
	Total Points	**22**	**9**

(Source: Author, 2024)

Before the planning calculation was carried out, the total assessment of the Green Building at the FTSP Building of Universitas Trisakti based on the efficiency of water use, was obtained 9 points from the maximum assessment point of 22 points.

4.1 With Strategic Planning

Table 5. Assessment Point of Water Efficiency With Strategic Planning

No.	Work Assessment	Points	Claimed Points
Assessment Point of Water Sources			
a.	PDAM or other drinking water company	1	1
b.	Surface water (river water, lake water, sea water) treated with permit	3	0
c.	Treated rainwater	2	2
d	Recycled water		
	Recycled water and grey water	2	2
	If equipped with a water meter, additional 1 point	1	0
	Recycled water from black water	3	3
	If equipped with a water meter, additional 1 point	1	0
Assessment Point of Water Consumption			
a.	Installation of a water meter at each groundwater outlet is planned	2	0
b.	Presence of a water consumption savings plan in the form of a water balance	2	2
Assessment Point of Water Fixtures			
a.	The building is planned to use at least 25% water-efficient fixture products of the total fixture procurement plan.	3	
b.	At least 50% of the total fixture procurement.	4	
c.	At least 75% of the total fixture procurement.	5	5
	Total Points	**22**	**15**

(Source: Author, 2024)

After the calculation of strategic planning, the total assessment of the Green Building at the FTSP Building of Universitas Trisakti based on water use efficiency was obtained 15 points from the calculation points.

5. Literature References

Journal of the Application of Water Conservation in Building C, Universitas Trisakti, as an Effort Towards Green Building" addresses the issue of freshwater scarcity in society, particularly in densely populated urban areas. It highlights one of Indonesia's problems, which is the inefficient use of water by the community. This study aims to assess the conservation value and water conservation measures in Building C of the Faculty of Civil Engineering and Planning (FTSP) at Universitas Trisakti. The method employed includes a descriptive approach with data collection through observation, interviews, and documentation, which is then analyzed using the Greenship Existing Building Version 1.1 criteria for water conservation (WAC). The findings indicate that Building C does not meet the expected water conservation criteria. To improve the water conservation rating, it is recommended to implement greywater recycling systems, drinking water filtration systems, and auto-stop faucets that can save up to 70% of water compared to manual faucets. These measures are expected to support the implementation of the green building concept in Building C, Universitas Trisakti [12].

Journal of the Evaluation of Water Efficiency in Office Buildings During Dry Seasons in Green Building Planning" involves calculations to assess water efficiency in office buildings, specifically Building Waskita Karya. Secondary data collected includes water-saving features, rainfall, floor area, site plans, and other relevant information. Water efficiency calculations consider wet days, where water comes from rain, and dry days, where the water source is from the municipal water supply (PDAM) and recycling. The water balance calculation uses the V10-2022 water balance software provided by the Ministry of Public Works RI. Results show conventional water consumption of 83,153 liters per day, with greywater recycling at 29,216 liters per day and blackwater at 14,143 liters per day. Water efficiency during dry days reaches 76.8%. This study aims for building owners to monitor water consumption and support green building performance and water cost savings [10].

Journal "Impact of Green Building Certification in Indonesia on Water Conservation Based on EDGE Certification System (Excellence In Design For Greater Efficiencies)" discusses how construction activities can negatively impact the environment, highlighting the need for solutions to manage energy consumption growth in the construction sector. The green building concept is one solution to manage energy consumption. The EDGE certification system is used to evaluate resource efficiency, especially water, in green buildings. This study analyzes the impact of green building certification on water efficiency using the EDGE system. Findings from the study on the Asean Secretariat Building show a water efficiency of 75.89% and indicate that the implementation of water treatment systems and sanitation types in green buildings significantly influences water efficiency [11].

The author's paper completes all of the reference journals above by calculating water use in buildings and calculating strategies to increase water savings in buildings by simulating strategy calculations, namely changing one of the components of water sanitation with 72 experimental simulations using the water balance software v2.6 and conducting water use efficiency assessment points in buildings based on Ministry of PUPR No. 01/SE/M/2022.

6. Summary

The research on the Water Use Efficiency Strategy in the FTSP Building of Universitas Trisakti FTSP Building succeeded in quantifying the percentage of water use efficiency. Based on the water system and water sanitation equipment, currently the FTSP building has a PDAM water efficiency of 4% or 3,122 L/day.

After conducting 72 simulation calculations. One strategy involves planning water savings by altering the water system and all sanitation facilities, resulting in an efficiency of 78.9% on dry days and 100% on rainy days. The second option involves only modifying the water system by utilizing harvested rainwater, which amounts to 107.93 liters per day, treating and recycling grey water from sinks (15,707 liters per day) and wudu faucets (21,671 liters per day) to be used again for non-potable water needs, and treating and reusing black water from urinals (7,722 liters per day), jet sprays (16,091 liters per day), and flushing of 13,655 L/day in buildings that are treated and reused for flushing and flushing of the garden so that additional water is obtained as a water source so that the efficiency of water use becomes 69.5% on dry days and 100% on rainy days. PDAM water saving of 100%. The next option is to change the ablution faucet with water-saving specifications can increase water efficiency to 14.3% on dry days and rainy days. After the strategy calculation, the water use efficiency assessment point in the FTSP building of Universitas Trisakti which was initially 9 points increased to 15 points from 22 assessment points.

This research has an impact in various aspects, the mitigation of positive impacts in this study can be assured by the audit of water use, the repair of infiltration wells and the existence of

adequate tanks, education on water use savings, and periodic maintenance. By implementing these measures, we can significantly reduce the water consumption of PDAM and contribute to the conservation of water resources. It is important to remember that water efficiency is an ongoing process and requires commitment from all parties. For further research, it can take into account RAB and analysis related to strategies that have been simulated in order to achieve good and affordable PDAM water use savings.

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