International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 11 | Nov 2026 www.irjet.net p-ISSN: 2395-0072

Smart Water Monitoring and Conservation System for Housing Societies

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Abstract - *Water management within housing societies can cause a problem. With varied numbers of people in each flat it creates a problem with manually tracking the usage, and whether the daily limit has been exceeded. This paper considers ways of smart monitoring, and has been developed into a software simulation to manage the water within the society. The secretary will enter in how many members are within each flat. Residents will also be able to see how much they are using based on their activities (cooking, bathing, washing). The software will collate the amounts of water used and show how much is left, alongside alerts. When the daily limit has been reached for a flat the valve will automatically show as closed. It also allows monitoring of the common areas and history. As this has been created with simulated data rather than using mechanical meters/valves it is to show the logic behind it and will not actually save water. This paper will discuss how the design works and what limitations there are and future developments.*

Key Words: Smart Water Management, Housing society, Water Conservation, Consumption, Quota, Valve, Simulation, Internet of Things.

1. INTRODUCTION

Housing societies will have multiple households using water which causes problems in managing [1] . The secretary may not know how the water is being used. Limiting the amount of water for each flat could be seen as unfair due to different family sizes. It would be useful to monitor the amount of water being used per flat, and clearly set limits[5]. This review has focussed on creating a software simulation. This allows the secretary to have a dashboard, and residents to see how much they are using based on their daily activities. When the limit has been reached the software will show the updated readings and change the status of the valve.

2. RELATED WORK

Within previous work smart water systems have been implemented through metering, demand management, feedback, and analysing consumption to find patterns of anomalies [3]. These can be useful for housing societies bathrooms and washing. The user will not be able to change the where there is water used within individual flats and common areas. This project could consider how basic rules can be applied using a simulation. This makes it easier to understand how the system would work without having to install anything. An IoT system can connect meters and control devices to an online platform [4]. Future versions of this project could include collecting data from flow sensors and sending commands to real valves[15][16]. This project has been developed with simulated data.

3. PROBLEM IDENTIFICATION

Tracking manually can be a problem for comparing between flats on the same day, and seeing if they have gone over. The water can be used within garden, cleaning and other common areas [9] . This means that the model would need to have different views for the secretary and residents, track daily consumption and apply consistent rules.

4. OBJECTIVE OF PROPOSED SYSTEM

To show how water can be managed within a housing society. The secretary will be able to enter information regarding how much water is available and set limits based on how many members there are. The software will show how much has been used, how much is left and group the consumption by activity. It will also show common area usage alongside alerts [8] . When the limit has been reached the valve will be shown as closed. To actually save water another study would need to be carried out.

5. PROPOSED SYSTEM/ROLES

Secretary/Administrator – The administrator will manage the settings within the society. This includes how much water is available, flat details, amount of members and daily water targets. The dashboard will give an overview of the inflow readings, total consumption, remaining budgets, valve status and alerts. The controls for the administrator will only be available to the correct role.

Resident – The resident view will show consumption and group the consumption by activity. This will include the kitchen, bathrooms and washing. The user will not be able to change the overall policy on how the water is being allocated. Permissions should be set within the application. In the example within this demonstration the resident view would not have any editing permissions. However future

development could allow more editing.

Monitoring Engine – This will either give or take example consumption. It will calculate the total consumption and compare to the quotas. Each flat/area will have their own valve status.

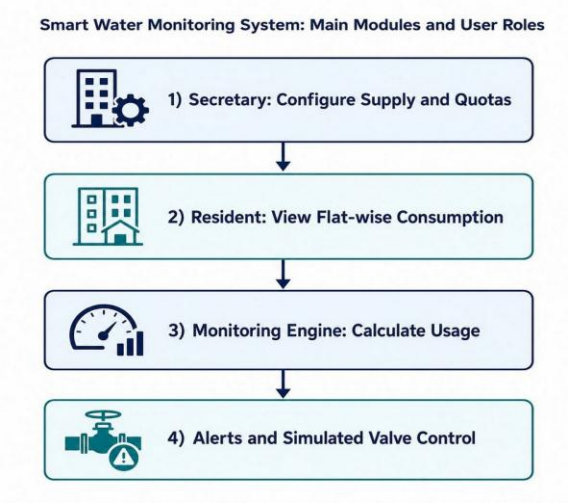


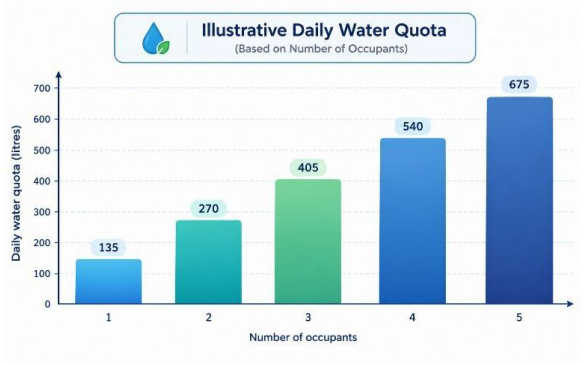
Fig. 1: Main modules and user roles

6. METHODOLOGY

The secretary will enter information regarding flats, amount of members and common areas. The limits will be set for each day. The simulation will add up the consumption for each activity. This will then compare to the target for the flat. It will show how much has been used with the amount used, remaining and percentage. When the total has been reached an entry will be made and the valve will be shown as closed. The next monitoring cycle can start on a new day or when reset by an authorised user.

Example of quota calculation – If the society decided to allocate 135 litres per person per day then a 4 member flat would have a target of 540. This is an example to help with understanding how the algorithm works. The actual target should consider how much water is available locally, policy and guidance.

If the cumulative unit total is less than the daily quota then they will be within their budget. If the total is equal or over the target the simulation will show that they have gone over the limit and the valve will be closed. Extra hardware would be needed to stop the water flowing.



Graph 1: Example of daily water quota (135 L/person/day)

If cumulative unit usage is less than the configured daily target, the unit will be within budget. If usage reaches or exceeds the target, the simulator will record an over-limit situation and the simulated valve for that unit will be closed. Additional hardware would be required to stop the water flowing.

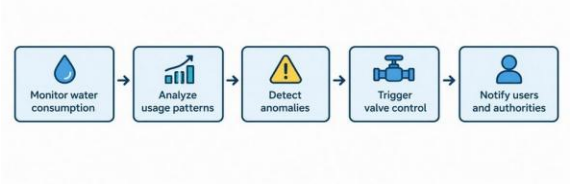


Fig. 3: Simulated quota check and valve decision

As shown in Figure 3, the simulation checks each flat individually. The daily quota is compared with cumulative activity consumption. While consumption is under the limit the simulated valve remains open; once reached, the affected flat's valve is shown as closed and an alert is recorded. Water is not physically turned off.

7. WORKFLOW

Set society settings > Register flats/members > Set quota by secretary > Simulate activity consumption > Calculate total consumption > Compare to quota > Update dashboard/alerts > Valve status changed for affected unit. Events will record any relevant changes.



Fig. 2: Proposed monitoring workflow

8. MODULES

1) Overview – This will show an overview of daily consumption, valve status, remaining budgets and recent events. Charts are included to make it easier to compare.
2) Flats/Consumption – This will show a breakdown of units, members, daily targets and consumption for each component. This shows where the consumption is coming from.
3) Public/Common Areas – This will show all areas that use water within the society. This includes gardens, toilets, cleaning and club houses.
4) Targets/Control – This allows authorised users to set quotas. The rule will be applied to only turn off the affected valve.
5) History/Alerts – This will log any consumption and control. This can be exported for basic analysis. This can help the society identify times of high consumption [5] .
6) Settings – This includes settings for the example. This includes simulated inflow capacity, speed of readings, default quotas and reset. This can help test different assumptions.

9. DISCUSSION

This model will allow the water to be allocated, logged by activity and limits checked. The simulation can be used to test how the system would work with varying amounts of members and consumption. There are questions as to how each household's specific needs will be managed. How incorrect readings can be fixed and who will be able to turn the valve back on. It is easy to show how the valve will be automatically turned off. However turning the water off to a home someone is living in can be a big decision. Any real system would need warnings, authorisation to override and to ensure essential water is still available. This project should be seen as a demonstration of how the rules would be applied.

10. LIMITATIONS AND FUTURE SCOPE

This project has been developed using example data. No real flow sensor, meter or valve have been connected. This means we cannot be sure how accurate the measurements would be and how reliable the system would be at detecting leaks. Future work could include adding sensors, secure role based access, controlling the valves and detecting anomalous readings [11]. A controlled trial could be carried out to compare the consumption across similar times and record any maintenance and feedback from residents.

11. CONCLUSION

This paper provides a software solution to manage shared water within a housing society. The proposed simulation allows for limits to be set by the secretary, consumption for each flat and common areas, logging of daily activities and alerts. When the allowance has been reached the affected valve will be closed. This provides a practical starting point to investigate how this would work. Real hardware would be needed to make claims about actual water saving.

REFERENCES

1) United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations World Water Development Report 2024: Water for Prosperity and Peace, UNESCO, 2024.
2) A. I. J. M. van Dijk et al., “The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society,” Water Resources Research, vol. 49, no. 2, pp. 1040–1057, 2013. doi:10.1002/wrcr.20123.
3) International Water Association, Water Loss Specialist Group, guidance and resources on water loss and water demand management, IWA.
4) A. Zanella, N. Bui, A. Castellani, L. Vangelista and M. Zorzi, “Internet of Things for Smart Cities,” IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22–32, 2014.
5) R. A. Stewart, R. Willis, D. Giurco, K. Panuwatwanich

and G. Capati, "Web-based knowledge management system: Linking smart metering to the future of urban water planning," Australian Planner, vol. 47, no. 2, pp. 66–74, 2010.

6) R. A. Boyle et al., "Intelligent metering for urban water: A review," Water, vol. 5, no. 3, pp. 1052–1081, 2013.

7) A. Cominola, M. Giuliani, D. Piga, A. Castelletti and A. E. Rizzoli, "Benefits and challenges of using smart meters for advancing residential water demand modeling and management: A review," Environmental Modelling S Software, vol. 72, pp. 198–214, 2015.

8) J. E. Froehlich et al., "HydroSense: Infrastructure-mediated single-point sensing of whole-home water activity," Proceedings of UbiComp, pp. 235–244, 2009.

9) C. Makropoulos and D. Butler, "Distributed water infrastructure for sustainable communities," Water Resources Management, vol. 24, pp. 2795–2816, 2010.

10) A. J. Zapata-Sierra, E. Salmerón-Manzano, A. Alcayde, M. L. Zapata-Castillo and F. Manzano-Agugliaro, "The scientific landscape of smart water meters: A comprehensive review," Water, vol. 16, no. 1, article 113, 2024. doi:10.3390/w16010113.

11) T. C. Britton, R. A. Stewart and K. R. O'Halloran, "Smart metering: Enabler for rapid and effective post meter leakage identification and water loss management," Journal of Cleaner Production, vol. 54, pp. 166–176, 2013.

12) S. Rahim, K. A. Nguyen, R. A. Stewart, D. Giurco and M. Blumenstein, "Machine learning and data analytic techniques in digital water metering: A review," Water, vol. 12, no. 1, article 294, 2020. doi:10.3390/w12010294.

13) H. Abu-Bakar, L. Williams and S. H. Hallett, "A review of household water demand management and consumption measurement," Journal of Cleaner Production, vol. 292, article 125872, 2021. doi:10.1016/j.jclepro.2021.125872.

14) F. Mazzoni, S. Alvisi, M. Franchini, M. Ferraris and Z. Kapelan, "Automated household water end-use disaggregation through rule-based methodology," Journal of Water Resources Planning and Management, vol. 147, no. 6, article 04021024, 2021. doi:10.1061/(ASCE)WR.1943- 5452.0001379.

15) S. Saiteja and V. A. Sankar Ponnapalli, "A review on smart water management in various domestic areas: An approach for water consumption and leakage perspectives," International Journal of Critical Infrastructures, vol. 19, no. 1, pp. 1–16, 2023. doi:10.1504/IJCIS.2023.129063.

16) D. L. Owen, "Smart water management," River, vol. 2, no. 1, pp. 21–29, 2023. doi:10.1002/rvr2.29.

17) N. T. Lunstad and R. B. Sowby, "Smart irrigation controllers in residential applications and the potential of integrated water distribution systems," Journal of Water Resources Planning and Management, vol. 150, no. 1, 2024. doi:10.1061/JWRMD5.WRENG-5871.